THE

JOURNAL

OF

THE ASIATIC SOCIETY

OF

BENGAL.

VOL. I.

THE

JOURNAL

OF

THE ASIATIC SOCIETY

OF

BENGAL.

EDITED BY

JAMES PRINSEP, F. R. S.

SECRETARY OF THE PHYSICAL CLASS, ASIATIC SOCIETY.

VOL. I.

JANUARY TO DECEMBER,

1832.

"It will flourish, if naturalists, chemists, antiquaries, philologers, and men of science, in different parts of *Asia*, will commit their observations to writing, and send them to the Asiatic Society at Calcutta; it will languish, if such communications shall be long intermitted; and it will die away, if they shall entirely cease."

SIR WM. JONES.

Calcutta:

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1832.

TO

CAPTAIN JAMES D. HERBERT,

Bengal Infantry,

LATE

DEPUTY SURVEYOR GENERAL OF BENGAL, AND SUPERINTENDENT OF REVENUE SURVEYS;

AT PRESENT HOLDING THE APPOINTMENT OF

ASTRONOMER TO HIS MAJESTY

The King of Oude:

WHOSE JUDGMENT ORIGINATED; WHOSE PERSEVERANCE AND EXERTIONS SUCCESSFULLY ESTABLISHED; AND WHOSE SUPERIOR ABILITIES SUPPORTED FOR 3 YEARS,

THE FIRST JOURNAL

IN INDIA

DEVOTED TO THE EXCLUSIVE PUBLICATION

OF

GLEANINGS IN SCIENCE;

THIS VOLUME,

IN ALL RESPECTS, BUT TITLE, A CONTINUATION OF HIS OWN WORK,

IS

Inscribed,

BY HIS ATTACHED FRIEND,

THE EDITOR.

CALCUTTA,
January 1, 1833.

PREFACE.

The ASIATIC SOCIETY, on the 7th March, 1832*, passed a resolution, that the monthly journal hitherto published under the name of "GLEANINGS IN SCIENCE," should be permitted to assume that of JOURNAL OF THE ASIATIC SOCIETY, and to continue it as long as the publication remains under the charge of one or both of the Secretaries of the Society. This privilege has, as it was anticipated, been the means of extending very considerably its circulation, while it has given a character and authenticity to the work, by its connection with an institution of established literary reputation, which no anonymous magazine, however well conducted, could hope to command.

The advantages of extended circulation have reacted to the benefit of subscribers, by enabling the Editor to increase the quantity of letter press from 400 to nearly 600 pages; and yet so constant has been the growing support of its contributors, that the pages of THE JOURNAL have been devoted, with few exceptions, to the insertion of original communications.

To many readers it would doubtless have been preferable that THE JOURNAL should contain more copious extracts from English scientific periodicals, which are not procurable in the interior of India; but conceding that, as an organ of Indian scientific intelligence, it must obviously derive its only merit among the many similar periodicals of the present day, from its stores of *oriental* literary and physical research, it will be generally acknowledged, that the first object of the work should be to give publicity to such oriental matter as the antiquarian, the linguist, the traveller, and the naturalist may glean, in the ample field open to their industry in this part of the world. While acting

* The January number was not published until the middle of March.—Since then exertions have been made to bring up arrears, and in future each monthly number will appear with regularity on the 10th of the following month; the insertion of the meteorological register rendering an earlier issue impossible.

on this principle, however, the Editor has not lost sight of the great utility of following, as far as means would permit, the progress of the various sciences at home, especially such as are connected in any way with Asia; the only limits thereto being want of space, and want of time to peruse and extract from the vast number of publications of the present day. Want of room also precluded the possibility of republishing the proceedings of the Medical and of the Horticultural Societies; but this had become less urgent since both of those useful bodies adopted the excellent rule of giving early publicity to their own proceedings and records.

To the Asiatic Society THE JOURNAL has naturally looked for its most frequent and interesting communications; and in consequence of its more intimate connection with that Institution, the proceedings of that body have been given in greater detail than heretofore, so that absent members may learn exactly what passes at its meetings, and what accessions are made from time to time to its library and its museum. Many absent members have complained of the quarterly subscriptions they were heretofore called upon to pay, while they remained in ignorance of what was going forward; this source of objection is now obviated, and perhaps a still greater amendment may yet be effected for their benefit, by an arrangement that all-members of the Society shall receive a copy of the Journal gratis, which will reduce their annual payments nearly one fourth.

It is unnecessary to recapitulate the contents of the present volume, or to allude in anonymous praise to those who have favored its pages with their assistance; since the authors have, in most cases, on suggestion, permitted their writings to be authenticated by the insertion of their names, as should always be the case in matters of fact, observation, and research. One illustrious name however must not be passed over without a tribute of gratitude for its valued and frequent contributions, a tribute more sincerely paid, since India has now lost the power and the claim to their continuance; she has resigned her most eminent oriental scholar to climes where his talents may find more genial appreciation, but where they cannot excite more respect or admiration, than they will ever command in the land which called forth their energies and directed their application.

The learned Societies at home will be proud to publish the continuation of the *Analyses of the Purânas*, of which the four first have appeared in these pages. Abstracts of four only were ready for the press, but translations of the remainder of the eighteen *Purânas* themselves had been completed under the superintendence of Professor Wilson, before he quitted India.

Mr. Alexander Csoma's indefatigable labour, in opening to us a first acquaintance with the literature of Tibet, will be estimated as it deserves by literary men—a contracted circle perhaps, because deep erudition and study are requisite to form critics capable of appreciating the nature and bearing of his peculiar researches upon the history, languages, and religions of other nations, both ancient and modern. All may however feel sensible of the devotion, zeal, and perseverance, which are necessary to lead a man, alone and unpaid, into a distant and wild country, to learn its language, and study its people at the fountain head. The volumes of notes which Mr. Csoma has presented to the Asiatic Society, will, it is hoped, be published in their Researches at length.

In furtherance of the desire of the Government, the greater part of Dr. Buchanan's Statistics of Dinajpúr has been printed in a detached form, as commenced by the Editor of the GLEANINGS; and to complete the work more speedily, two extra numbers have been issued in the course of the year. It will be remarked, that there are many plates referred to in the text: the drawings alluded to are in possession of the Honorable Court of Directors, along with the original manuscripts; it was thought better to preserve the references, in case the Hon'ble Court might hereafter be persuaded to publish them, either in a separate form, or of a size adapted to the present edition. It must not be forgotten, that it is this undertaking which gained to the GLEANINGS the valuable privilege of free postage through the Bengal Presidency. The Editor is happy to announce, that the same boon has, in the most liberal manner, and without any solicitation, been extended to the Presidency of Bombay and to the Government of Ceylon, by their enlightened Governors, His Excellency the Earl of CLARE, and the Right Honorable Sir R. W. HORTON, to whom his thanks are thus publicly and respectfully addressed.

To his numerous correspondents, the Editor can but proffer thanks for past, and solicitations for future, support, bidding them remember that, the scope and object of this publication embraces the literature, the manners, the geography, physical and mineral, the arts, the natural productions of Asia, the phenomena of its climate, and observations of the heavens. In the words of the illustrious founder of the Asiatic Society, " the bounds of its investigation will be the geographical limits of Asia; and within these limits its inquiries will be extended to whatever is performed by man or produced by nature."

Dedicated, by permission, to

LADY W. C. BENTINCK,

A

TREATISE

ON

THE MUSIC OF HINDOOSTAN,

COMPRISING A DETAIL OF

THE ANCIENT THEORY

AND

MODERN PRACTICE.

THE similarity of the music of Egypt and Greece to that of this country has been traced and pointed out: harmony and melody have been compared: and time noticed. The varieties of song have been enumerated, and the character of each detailed: a brief account of the principal Musicians superadded, and the work concluded with a short alphabetical glossary of the most useful musical *Terms*.

BY

CAPTAIN N. WILLARD,

Commanding in the Service of H. H. the Nuwab of Banda.

Price to Subscribers, Sa. Rs. 8.

PROSPECTUS.

A TREATISE on the Music of Hindoostan was much wanted. The scanty information obtainable through the channels of Dr. GILCHRIST and Sir WILLIAM JONES, are neither of themselves sufficient to fill this chasm, nor do they elicit light sufficient to enable one to grope through the various obscure writings in the vernacular languages and dialects. The songs set to music by Mr. BIRD and Mr. WALKIER, are of the more modern style, and not of the ancient school; so that, instead of elucidating the theory, they lead us into confusion, when compared with the tables of Rags and Raginees given by Sir W. JONES.

The forthcoming work has been written with the view of describing in some measure, the theory and practice of the original music of Hindoostan, but chiefly to unfold the beauties of which it is susceptible. The extravagant eulogium offered to the music of ancient Greece, and the striking similarity which appeared to the author to exist between that and the subject to be treated of in this work, has led him to point them out, in the hope that, should a taste for the music of this country obtain among the professors of the science in Europe, it might perhaps conduce to the elucidation and revival of a much-desired and lost branch of knowledge, namely, the music of ancient Egypt and Greece.

For this purpose it appeared to the author, that a bare translation of any of the existing native works would not suffice. All who have been taught music are so much accustomed to the European way of explaining it, that every other must necessarily appear uncouth and preposterous. In the arrangement of this work, therefore, the European system has been adopted.

CONTENTS.

N. B. *The work will be printed on superior English paper, at the Baptist Mission Press, Calcutta.*

Subscriptions will be received by Mr. A. Jewell, Moorghehuttah, and Messrs. Thacker and Co. St. Andrew's Library.

CONTENTS.

No. 4.—APRIL.

No. 5.—MAY.

DIRECTIONS TO THE BINDER.

The sheets of Buchanan's Statistics are to be separated from the monthly numbers. The Plates may either be bound up at the end of the volume, or in the following order :

ERRATA.

Page 10 line 9 *for* "wool," *read* "wood."
—— 11 — 7 *from bottom, for* "plate 1, fig. 2," *read* "plate 2, fig. 1."
—— 14 *last line, for* "delomite," *read* "dolomite."
—— 19 — 16 *from bottom, for* "3, 4, 5," *read* "1, 2, 3, 4."
—— 20 — 8 *from top, for* "plate 1," *read* "plate 2."
—— 20 — 9 *for* "he protracted," *read* "the protracted."
—— — — 11 *for* "BB″ B′," *read* "B″ B′."
—— — — 16 *for* "intercepts," *rsad* "intersects."

AND

In Fig 2, *plate II.* continue the dotted arc 1′ 1 *a″* to *a′*.
The line A *c′* continue to *c*.

—— 28 — 7 *from top, for* "manima," *read* "minima."
—— — *at bottom, for* "Artesien," *read* "Artesian."
—— 33 — 7 *for* "January," *read* "February."
—— 410 — — *in last column* of Table II. *for* "2m. 58s. 8," *read* "0m. 58s. 8."
—— 46 — 18 *from top, after* "which" *insert* "comma."
—— — — — ———————— "either" ditto.
—— 47 — 2 *from top, for* "have," *read* "has."
—— 57 — 12 *for* "$99\frac{1}{4}$ $99\frac{1}{2}$ $99\frac{3}{4}$," *read* "99^{1} 99^{2} 99^{3}."
—— 59 — 24 *and throughout the article, for* "sack," *read* "sac."
—— 60 — 4 "orbitar," *read* "orbital."
—— — — 10 "interval," *read* "internal."
—— — — 29 "lips," *read* "tips."
—— — — 34 *dele* "by."
—— 60 — 15 *for* "compressed and hard; before," *read* "compressed and hard before ;"
—— — — 28 *for* "lips," *read* "tips."
—— 62 — 11 *for* "this Chiru," *read* "the Chiru."
—— 63 — 10 *for* "bambdoidal," *read* "lambdoidal."
—— — — 14 *for* "malars," *read* "molars."
—— 65 — 8 *for* "$1\frac{1}{8}$," *read* "$\frac{3}{1\ 8}$."
—— 67 — 2 *from bottom, after* "than," *read* "the."
—— 74 — 15 *for* "9°," *read* "9^{1}."
—— 75 — 21 *dele* "rufous," repeated.
—— 79 — 17 *from bottom, for* "done," *read* "donc."
—— 148 — — *foot note, for* "Rutboo," *read* "Kubboo."
—— 226 1st par. 5th line *for* "Ekadantashtra," *read* "Ekadanshtra,"
—— 226 4th „ 4th — *for* "Kridama," *read* "Srid'ama"
—— 229 2nd „ 5th — *for* "Vrishapati," *read* "Vrihaspati."
—— 231 — „ 3rd — *for* "Viswaséna" *read* "Viswakerma."
—— 238 — „ *after* "Ganges river," *insert* "at Gházipur."
—— 245 10 „ *from bottom, for* "it," *read* "the mirror."
—— — 1st „ 7th — *for* "He having," *read* "Having."
—— 296 line 3 *for* "but mostly," *read* "and,—"
—— — — 7 *for* "hydrogen. When," *read* "hydrogen, where."
—— 305 — 20 *for* "circumference," *read* "diameter."
—— — — 21 *for* "$27\frac{1}{2}$ rupees," *read* "$2\frac{1}{2}$ rupees."

Errata in Meteorological Register, for June.

Date	Hour.	Bar.		
13	Sun-rise,	*for*	,365	*read* ,465
14	,,		,399	,499
22	,,		,517	,617

Add 0,010 to all the figures in the Barometrical column for 10½ P. M.

—— 340 — 6 *after* "*Rhinolphus*," *insert* "and two species of *Vespertilio*."
—— 355 — 13 *for* "ακανσα," *read* "ακανστα."
—— 355 — 2 *from bottom, after* "*nilam*," *insert* "*nil mani*, (or *manik*.)"
—— 356 *after* "College of Fort William," *insert* "the word *bahrmani* is also used in the *Khawás-ul* [illegible]*ir*, as a variety of the *yaqút*."
—— 358 — 20 *dele* "or a species of garnet."
—— 358 — 22 *for* "*manik*," *read lálri*."
—— 403 — 5 *from bottom, for* "ΔΙΟΚΛΠ," *read* "ΔΙΟΚΛΗ."
—— 404 — 14 *for* "OVA," *read* "OΥA."
—— 411 — 8 *for* "Latitude 25° 43′," *read* "Lat. 25° 47′ 26″."

In Table IV. of the Estimate of Life in India, page 284, the first four figures in the second and third column should stand thus:

Age.	Survivors.	Deaths.
20	52221	473
21	51748	489
22	51259	522
23	50737	557

The mistake arose from the calculations having originally been made to commence with the age of nineteen, instead of twenty: and the 5 year averages in Table III. page 283, will all be slightly affected by the same cause. The last figure in the second column, page 284, should be reversed; and in the last column but one, *for* "2080," *read* "2008."

Line 414 line 3 *from below, for* "molluscæ," *read* "mollusca."
—— 444 — 36 *after* "ministry," *insert* "of a man."
—— 445 — 3 *from below, for* "2125," *read* "212.5."
—— 446 — 7 *for* "in bullion," *read* "bullion."
—— 447 — 21 *for* "will be," *read* "would be."
—— — — — *after* "at any," *insert* "rate."
—— 480 — 15-16 *for* "Tariqa-i-Chishíta," *read* "Tariqa-i-Chishtía."
—— 483 — 36 *for* "lost about," *read* "tost about."
—— — — 39 *for* "Mújtahid-i-mústuqill," *read* "Mújtahid-i-mústaqill."
—— 485 — 20 *for* "Taqwiat-ul-Imám," *read* Taqwiat-ul-Imán."
—— 487 — 15 *erase* "5" at beginning of line.
—— 488 — 7 *for* "differences," *read* "difference."
—— 489 — 20 *for* "Káfr," *read* "Kufr."
—— 491 — 23-24 *for* Ishrák f'il Tasarraf," *read* "Ishrák f'il Tasarruf."
—— 492 — 10-11 *for* "the authority or influence of Saints, as respecting intercessors," *read* "respecting the authority or influence of Saints as intercessors."
—— 498 — 23 *for* "Khátim," *read* "Khátima."
—— 501 — 12 *after* "A B C," *insert* "[fig. 5.]"
—— 505 — 20 *for* "5 53 59," *read* "5 52 59."
—— 506 — 11 *for* "5 53 10," *read* "5 53 27."

JOURNAL

OF

THE ASIATIC SOCIETY.

No. 5.—*May*, 1832.

I.—*Some Account of the Lacquered or Japanned Ware of Ava. By* Major H. Burney, *Resident at the Burmese Court.*

[Read at the meeting of the Phys. Cl. 4th March.]

This manufacture has been named lacquered ware from an idea, I suppose, that lac forms a part of it; but this is a mistake: no lac is used, and the bright red colour is given by vermilion, which is made by the Burmese from Cinnabar *(a-yain)*, imported by the Chinese caravans from Yunan.

The principal material is known to be the Burmese varnish, or *theet-tsee*, which means literally "wood oil." There must be a great abundance of it in the country, as the usual price at the capital is only ¾ of a *tical* per *viss*, or about 5 pence per lb.; but it is often much adulterated, and requires to be strained through a piece of cloth before being used. There are three descriptions of it at Ava. The first and purest is called *theet-tsee-ayoung-den*, from *ayoung* colour, forming of itself a beautiful black colour. The second is called *theet-tsee-anee-byau*, from *anee* red, being that commonly used with vermilion or red colour. This is said to have one-quarter of water mixed with it. The third and worst description is called *theet-tsee tha-yo-byau*, from *tha-yo*, a paste, which will hereafter be described, and to make which, this *theet-tsee* is generally used. This last kind has no less than one-half of water mixed with it, and there is said to be no difficulty in making water combine with the *theet-tsee*, by rubbing the two well together in the sun. The price of the best *theet-tsee* is just now at Ava 7 *ticals* for 10 *viss*.

The Burmese workmen declare, that the varnish will not *ait,* sleep or lie, or dry well, if collected from the tree when it is in fructification; which, they say, occurs during the three months of January, February, and March. Nor will the lacquered ware, during the process of manufacture, become soon and properly *ma*, or hard, in the dry hot months before the rains set in, or at any time so well, as when it is lodged, as Dr. Wallich understood, "in dark and cool subterraneous vaults." The varnish is placed in the sun for a few minutes before it is used, and being almost always applied with the hand, the smallest grain of sand or other extraneous substance is immediately detected and removed. When first applied, it looks of a light-brown colour, but as the hand is rubbing on the varnish, it becomes darker, until it attains a beautiful black colour. Sometimes, when the frame work is of wood, a piece of tow is used for rubbing the *theet-tsee* on, and generally, to save the hand, the first coat is applied with a rude brush made of the husk of the cocoa-nut. After using the varnish, the hand is cleaned with a little mustard-seed oil, and coarse cloth or tow. Upon asking the workmen if they do not suffer any bad effects from the varnish, as I recollect reading of some one at Edinburgh having suffered severely, they admitted that they often, and particularly when they first begin to work in it, find their hands blister and their arms and faces swell, but that some people are much more pre-disposed to suffer in this manner than others. Hence, they have a kind of proverb, *theet-tsee thek-sè thee* "varnish is a witness;" *loo-ma-then phyet-thee*, "it affects a man not true;" *loo-then atwama-shee*, "to a true man it matters not." About one in a hundred is said to be so predisposed. Some of the workmen told me, that they always use their left hands in taking their food, and that sometimes the deleterious effects of the varnish appear in blotches so much resembling leprosy, that other Burmese refuse to hold intercourse with workmen so affected. These effects however are removed by applying to the affected parts a lotion made of teak-wood rubbed on a stone with a little water. Sometimes sandal-wood as well as teak is used, but the latter is considered as the real specific. As a preventative, many workmen occasionally swallow a small quantity of the varnish.

The *theet-tsee* itself forms a beautiful black colour, but to improve its brilliancy and transparency, the article covered with it is often polished in the same manner as the Burmese polish the fine marble, with petrified wood powdered very fine, repeatedly washed, and then dried; and for this purpose, the petrified wood of a particular tree

called *En-gyen** is esteemed. A little of some scented wood is added, but this, apparently, is not indispensable. This polishing powder is called *en-gyen-kyouk-tshowè amhoun.*

There are few colours which will preserve their tint when mixed with this varnish; vermilion answers best. The Burmese prefer a vermilion, which they make themselves, to that brought from China, and it is certainly of a much brighter scarlet. Only one man at the capital, and he is attached to the palace, is said to know how to make this vermilion, which is called *hen-za-pa-da yowè,* from the colour resembling that of the little scarlet seed with a black spot named *glycine abrus* or *abrus maculatus* in Marsden's Sumatra, 3rd edition, p. 171. There are two other descriptions of vermilion made at Ava, called respectively *hen-za-pa-da Awa* and *hen-za-pa-dah Gouk,* which last seem more like our red lead. The vermilion brought from China is called *hen-za-pa-da atshoun,* and the Burmese say that it is the refuse or grounds of the finest kind, and that it does not mix well with *theet-tsee.* Red ochre or Indian red, called *myè-nee,* red earth, gives a duller colour, and is used for lacquered ware of the coarsest description. It is sometimes used also as a first coat, over which the vermilion is applied. These paints, when used, are first made liquid with a very small quantity of an oil brought from Laos, called *Shan-zee* or *Shan* oil, and then mixed with *theet-tsee,* in the proportion of three parts of the varnish to five of the vermilion. This *Shan-zee* is said to be extracted from the fruit of the *kuniyen* tree, *(Dipterocarpus turbinatus,)* the trunk of which yields the common wood oil, used in the manufacture of torches at Tavoy and Mergui. The Burmese however say, that the Shans conceal the manner of making this oil, because if it could be manufactured in Ava, there would be no occasion for importing it from Laos. It sells at Ava for 4 ticals per viss. The *kuniyen* tree, which is so abundant to the southward, and which affords the inhabitants there so cheap a substitute for candles, cannot be very common near the capital, where I have never seen a torch, the petroleum only being used by all classes for lights. A mixture of this Shan oil and *theet-tsee,* ten parts of

* The same tree is mentioned in the inscription on the Rangoon great bell; see Asiatic Researches, vol. xvi, p. 271 and 276.—Gaudama was born under this tree, and died between two of the same species. He was perfected into a Boodh under another tree, the *Nioung* or *Baudi beng,* the Ficus Religiosa. I have never been able to get a specimen of this *Engyen* tree, although I am assured that it is to be seen to the south-east of Ava, and even at Moulmien, and in a fossil state portions of it are to be found all over the country between Prome and Ava.

the latter to three of the former, is used as a semi-transparent varnish. When put over any other than black it darkens the colour a little, but adds much to its brilliancy and transparency. The Burmese possess no really transparent varnish, and it would be satisfactory to know, if any could be obtained from the *theet-tsee*, by distillation or other means.

There are three descriptions of lacquered ware in Ava. The first, and by far the best articles, are brought from the Shan countries—*Shan-pyee-ga*; and *Lè-gya*, Dr. Buchanan's Lækhia, a Shan province, situate to the S. E. of Ava, is the principal place of manufacture. The Shan ware may be distinguished by the lightness and elegance of the manufactures, and the superior brilliancy of the varnish and colors. The next are those manufactured at a place called *Nyoung-oo**, and its neighbourhood, near the ancient capital, *Pugan*. These are generally distinguished by their being of yellow or green colours; and almost all the small betel boxes, *kwon-eet*, in use among the Burmese, are of this kind. The best of this kind are made at *Pugan* itself, and called after that town, but the larger proportion is named from *Nyoung-oo*. The last and worst description of articles is manufactured in the city of Ava and its environs, and these are to be distinguished by the coarseness of the work, its plain red colour, and the frame being generally of wood and not of basket-work. Most of the plain red large boxes with high conical covers, *thamen tsaouk-gyee*, and other vessels used by the Burmese for holding food, are of this description. The lacquered boxes from Laos have upon them tasteful figures and other ornaments of a beautiful black colour or of gold, and those from *Nyoung-oo*, have them of yellow or green colours. Many of these boxes are so thin that you may discern the basket work through the varnish. The best ware is tried by seeing whether the edges of two sides can be made to meet without cracking the colour or breaking the article. I believe none but a few Shan boxes will bear this test.

The different figures and ornaments on the lacquered ware are executed in the following manner, called *Yowon-tho*, or engraving after the manner of *Yowon*, which was the general term formerly applied by the Burmese to Northern Laos and Zenmay, but which, and some-

* *Nyoung-oo* means Fig-tree Point. The name of this place, where Lieut. John North, one of our early envoys to Ava, died, and was buried on 30th August, 1755, has been strangely used. Capt. Baker writes it *Young-owe* and *Pegang Young-ue*; Symes, *Nioun-doh*; Cox, *Gneayan Gu-cayne* and *Gucayen*; Crawfurd *Nyaung-ngu*; and Wallich *Gnaunee*. The Burmese lower classes scarcely pronounce the *nung* of *Nyoung*, which has led a friend of mine to write the name *Gnee-a-oo*.

times with *gyee* or great added, is the name now given to Cochin China only. After the last coat of varnish has been applied, and it is thoroughly dry, figures, lines, &c. are described by the lacquered ware being scooped or scratched, just deep enough to remove two or three coats of the varnish, with rude steel tools, either sharp pointed or having the point slightly divided. This last described instrument is called *tsout:* it is used like a gouge, and guided by the thumb of the left hand whilst the right is scooping out the lines. The former instrument called *gouk*, is often nothing more than a broken needle tied to the end of a small piece of stick, and it is used to describe the circular lines; the lacquered ware being turned round with the help of the knees and left hand against the instrument held steadily in the right hand. It is surprizing how quickly the workmen use these rude gravers, which are sharpened with a piece of slate usually brought from *Shwè zettau* on the road to Arracan, and called *Shwè-zet-tau-Kyouk*. When being sharpened, the instrument is held against the forefinger of the left hand, and the slate, moistened with a little spittle, is rubbed against it. The edge also of the slate on one side is made fine, for the purpose of being rubbed within the divided point of the *tsout*. When the figures and ornaments are furnished, a coat of vermilion and *theet-see* is put over the whole surface of the ware, and allowed some days to dry. The ware is then placed on the lathe, and turned round against some wet bran pressed down upon it with the left hand, and occasionally washed in water. This process rubs off all the vermilion from those parts which are in relief. A second and a third coat of vermilion is applied, and partially removed in the same manner. It is then placed in the sun for a few minutes, and when perfectly dry, a coat of the semi-transparent mixture, before described, is put on, rubbed off with a piece of cloth, and a second coat put on, which is allowed some days to dry, for the Shan oil always takes a long time to dry. This kind of engraving is the most tedious and expensive, and it is called *Shan Yowon-tho*, the Shan *Yowon* engraving, from the circumstance of all Shan boxes being so ornamented. The *tsout* or *gouk*, somewhat in the manner of our wood engraving, scoops or cuts all the surface except the figures and ornaments required, which remain black, the colour of the original ground, whilst those parts only where the gravers have made hollows or incisions, are afterwards filled up with red. The *Shan Yowon-tho* executed by Burmese workmen can never be made to look so well as that done in the Shan countries, owing either to the *theet-tsee* not being so fresh and pure, as the workmen allege; or to the Shans making use of some other materials unknown to the Burmese, which last I am

inclined to think is the more probable cause. The Burmese also state, that the Shans allow their lacquered ware several months to dry between each stage of the manufacture. But a much more easy and expeditious mode of engraving is the *Burma-dho*, or *Burma Yowon-tho*. It is usually executed over a coat of vermilion, but it may be done before that color is given, and upon a black ground. The figures and ornaments here are cut in the style of our line engraving, and when completed, some plain *theet-tsee* is rubbed over the whole, and immediately wiped off with a piece of cloth. A little Shan-zee or oil is then rubbed and wiped off in the same manner. Some yellow sulphuret of arsenic or orpiment, called by the Burmese *tshè-dan*, and by natives of India *hartal*, is powdered fine and rubbed dry over the surface of the lacquered ware. The mineral adheres only to the lines cut or scooped out, and displays at once in a bright yellow colour the figures and ornaments designed. Nothing further is done unless a finer polish is required, in which case the polishing powder before described is used some days after. Sometimes a little of the orpiment is mixed with Shan oil and *theet-tsee*, and a coat of it put over the whole ware and wiped off, and the powdered mineral then rubbed on. This process seems to be the best, as the hollows and incisions of the gravers are more filled up in this manner. The orpiment is powdered very fine, and large quantities of it rubbed on the ware with the fingers. Green (*atsein*) is put on in the same manner, the colour being previously made with the *tshè-dan*, and either the juice from the leaf of a plant called *gwè-douk-beng* or Indigo, ten parts of *tshè-dan* to one of Indigo. I have tried to use some English lamp black, prussian blue, and chrome, as this orpiment is used, but without success; probably other of our paints, or even these with some addition, might be employed in this simple and expeditious style of ornamenting wood work or lacquered ware with the aid of *theet-tsee*. The Burmese admire much these kinds of engraving, although I think the plain scarlet or black surfaces when polished look better. The different kinds of Japan work are always distinguished, if engraved, with the epithet *yowon-tho*, *yowon-tho tha-men-tsa ouk-kyee*, *yowon-tho*, *kwon-eet*, *&c. &c.*

As the best mode of ascertaining the manner in which this ware is manufactured, I engaged, at different times, two parties of Burmese workmen, to attend at my house, and prepare some cups in my presence, when I had an opportunity of daily watching their progress. The first party consisted of rather rude workmen, but the second was sent to me by the Burmese ministers, and some among this party prided themselves upon having made betel boxes for Her Majesty the Queen.

A frame of bamboo basket work, of the size and description required, was first made over a wooden form or *poun*. The finer the basket work, the lighter and finer will the lacquered ware appear when finished. There are two kinds of bamboo used, one called *myen-wa*, for the coarser kind of basket-work, and the other *ten-wa ;* and there are three kinds of weaving or *ayet* of the basket-work required for lacquering. The first and finest, and that of which all the smaller *nyoung-oo* boxes and almost all Shan-boxes are made, is called *kyoung-lein-yet*. The second, used chiefly for cups, except the rims, which are of the first pattern, is called *katein-gya-yet*. The third is used for the large round boxes, and for any coarse work ; and this is called *powet-kyoung-yet*. The frame work of the lacquered boxes with high conical tops is almost always of separate pieces of wood joined together.

Upon the outside only of this basket-work, with the wooden form inserted, a thin coat of *theet-tsee* was applied with a brush made of a piece of cocoanut husk. This was allowed three days to dry, not in the sun, but in a cool sheltered part of the house, within an old wine chest, which had a layer of earth at the bottom, and its inner sides covered with mud. The box was shut up also, so as to prevent any dust from falling upon the manufacture ; yet the workmen complained, that the varnish did not dry so hard, or quickly, as it would have done in a subterraneous vault. Every house in Ava, where this ware is manufactured, has a deep cellar or vault, in which the ware is lodged during the time the varnish is drying. In some Shan boxes parts of the basket work are left plain, and are not covered with *theet-tsee*, and of these the basket-work is very fine and delicate.

At the end of three days a kind of paste was made and put over the basket-work. There are several kinds of this paste, which is called *tha-yo*, probably from *tha-yowot*, mortar. One kind is made of bones calcined and pounded, sifted through a piece of cloth very finely, and then mixed with the *theet-tsee* into the consistence of paste. This is called *ngo-wa-yo-bya tha-yo*, " Cows' bone ashes *tha-yo*," or simply *amè* or *ayo-bya tha-yo*, " bone ashes *tha-yo*." Another kind, and which is most commonly used, is made of bran or husk of paddy, burnt, and the ashes sifted and mixed as before described. This is called *phwè-bya tha-yo*, " bran ashes *tha-yo*." A third kind is made of the saw dust of teak wood mixed, without being burnt, with *theet-tsee*. This is called *ky-won-theet-lhwa-za tha-yo*, " teak-wood saw-dust *tha-yo*," or simply *lhwa-za tha-yo*, " saw-dust *tha-yo ;*"— it is of a thicker consistence than the other two, more like mortar, and moistened with a little spittle as it is being applied. This paste is

used in filling up any little holes, and joining on the stands or different pieces together, and the separate parts of the frame-work of the high conical boxes are fixed together with this cement, which becomes as hard as wood, and which would really assist the famous project of converting saw-dust into deal boards. The ornaments like little rails, fixed around the sides of some of the boxes, are made with this *tha-yo*, pressed with little tin moulds or stamps into the pattern required, and then fastened on. A fourth kind of paste is made with the ashes of cow-dung, *ngowa-gyee-bya*, sifted finely, and mixed with *theet-tsee*, which has been put over fire until beginning to boil. The two are then well mixed and beat together, whence this paste is called *tè tha-yo*, or "beaten *thayo*." This looks like putty, and is used principally by gilders in fixing flowers or other ornaments upon wood-work, to which it adheres very tenaciously ; and before it hardens, it is so pliable and elastic, that it may be drawn out into the finest lines and twisted into any shape. But much of the cheapest and coarsest description of Japanned ware manufactured at Nyoung-oo, is said to have the basket-work covered with a paste of cow's dung and mud only, over which one or two coats of *theet-tsee* are applied. This paste is always liable to crack and chip off the basket work, and the Burmese consider this kind of manufacture, in which very little *theet-tsee* is used, as an imposition.

All the above descriptions of paste form good cements for joining wood-work. For this purpose, the best kind is a mixture of the bone ashes *tha-yo* with a little teak saw-dust ; and I have found it answer as an excellent substitute for glue, not being so liable to be affected by damp weather. It is only longer drying, as much as five or six days. It answers very well also in filling up the cavities left in fine cabinet-work, when the thin black edging has broken or fallen off. When dry it must only be rubbed smooth and even with a stone, in the manner hereafter described.

To return to the cups, which the Burmese workmen prepared under my eye. On the second day, the rim of the cup was cut round smooth, and the fine description of basket-work at the top was scraped and thinned with a knife, so as to bring it more on a level with the other part. The hole at the bottom, where it is fixed to the form when being wove, was filled up with a little of the saw-dust *tha-yo*. The whole inside and outside, was then covered over with a paste made of *theet-tsee*, bone ashes, and saw-dust, three parts of bone ashes to one of saw-dust. The workmen called this the *tha-yo-gyan* or "coarse *tha-yo*," declaring that for this first coat of priming, this mixture of the

two was best, as adhering most closely to the bamboo basket-work. It was applied with the fingers.

At the end of three or four more days the rim of the cup was cut still more even, and the cup was fastened to a lathe, called *tset-khoun*, and the inside was ground perfectly smooth and even in the manner hereafter described. A coat of *ayo-tha-yo*, "bone ashes *tha-yo*," or *tha-yo akhy-au*, "fine *tha-yo*," was then put on with the hand in the inside, and laid smooth with the finger, occasionally dipped in water. At the lathe the left hand is employed on the cup, whilst the machine is turned with the right hand, which moves to and from the workman a long stick tied to a leathern string, that has two turns around the lathe. Forms or chucks of the size required, are fixed to the spindle of the lathe with little pieces of bamboo; and when the outside of the cup is to be turned, the cup is fitted to these chucks, which enter about an inch and a half within it. But when the inside of the cup is to be turned, a cylinder of coarse basket-work open at both ends, called *tsee*, is fixed to the chucks, and within this cylinder, the whole of the cup is lodged, and fastened, if necessary, with little slips of bamboo at the sides. To make the coat of coarse *thayo* perfectly smooth and even, the cup is smeared over with a little water and a kind of red earth, and is then turned against a piece of pumice stone, and occasionally moistened with more water. The cup was placed in the sun to become perfectly dry, before the *thayo* was put on. The large boxes with high tops are fastened to a different kind of lathe, like our centre lathes. The upper end is either inserted into one side of the lathe, or fitted on a pin there; and to the bottom is fixed a piece of wood, which revolves around another piece fastened to the other side of the lathe. The two sides of the lathe may be made to approach or recede as required, to hold the ware between them. The string is put round the box, and the left hand usually moves the stick, whilst the right holds the pumice stone. Usually, one coat only of *thayo* is put on the wood work of these boxes; but they are rubbed smooth and even, three times, with the different kinds of stone; once after the *thayo*, once after the first coat of varnish, and the last time, after a second coat of the varnish. The *thayo* is put on at once over the wood, and there are three coats of varnish before the vermilion is applied.

At the end of three more days the cup was again fixed to the lathe, and the outside was treated in the same manner as the inside had been before, the coat of coarse *thayo* on the outside being rubbed smooth and even, and when perfectly dry, a coat of fine *thayo* put on. The workmen said that it is better to do only one side at a time.

At the end of three more days the cup was fixed to the lathe, and the inside made smooth and even with a kind of sandstone, called *kyouk-pyen-gwè*, and a little water; then with a rag, and a little fine powdered charcoal of teak-wood and water, and lastly with a moist piece of cloth. When perfectly dry in the sun, a coat of plain *theet-tsee* of the best kind, or *theet-tsee ayoung-den*, was put on in the inside with the finger. This was done in the sun, to which the cup was afterwards exposed for about a quarter of an hour. The workmen seem to prefer always to use the varnish in the sun. Besides the *kyouk-pyen-gwè*, which is the same kind of stone as that on which the Burmese grind sandal-wood to rub on their bodies, there is a stone of a finer grain sometimes used, called *shwè gan-gyouk*, from the circumstance, I am told, of gilders using it to polish the articles they desire to gild.

At the end of four more days, the cup was fixed to the lathe, and the outside was treated in exactly the same manner as the inside had been on the preceding day, ground smooth, and covered with a coat of fine *theet-tsee*.

At the end of five or six more days, for the varnish did not dry sufficiently before that time, a second coat of the fine varnish, or *theet-tsee ayoung-den*, was put on the outside and inside of the cup.

Before applying a coat of vermilion the cup was fixed to the lathe, and the polish of the two fine coats of *theet-tsee* was removed by turning the cup against the stone *kyouk-pyen-gwè* only, and afterwards against some bran and water pressed upon it with the left hand. The object of this operation, as well as that of grinding with some powdered teak-wood charcoal and water with a rag, was to remove the transparent effect of the fine *theet-tsee* before the polishing powder above described, *engyen kyouk-tshowè-amhoun*, was used. In doing which, the cup was turned against the palm of the left hand, smeared with a little of the powder.

In gilding, the wood-work is primed two or three times with the *ayo-bya* or *phwè-bya thayo*, and rubbed quite smooth and even with the stone and water, before the gold leaf is put on, which is done, as Dr. Wallich describes, "by besmearing the surface very thinly with the varnish, and then immediately applying the gold leaf." The priming is, of course, here necessary to fill up the cavities in the wood, and produce an equal surface before the gold leaf is put on. A little piece of cotton is dipped in the varnish, and before the surface is dry, the gold leaf is put on with the thumb and finger, and gently smoothed over with another clean piece of cotton. The gilders also use a brush of the thickness of a man's thumb, with which

small pieces of gold leaf are taken up and introduced into cavities or hollow ornamental parts of the wood-work, in the same manner as our gilders use a squirrel's tail. This brush is made of the hair taken from the inside of cow's ears; and the workmen declared, that it requires an hundred cows to make one brush. I had a picture frame gilt, and although the gilding has not the lustre of one of our's, it has the advantage of remaining with the frame; for the Burmese priming does not break and chip off, as the coat of whiting over our picture-frame does. The Burmese have no idea of burnishing their gilding; and if their priming would take the burnisher, their gilding would not only equal our's in lustre, but being more durable, would be preferable. The workmen could make nothing of a dog's tooth, which I pointed out to them as a burnisher; but this was owing probably to our not knowing the exact time of applying it. The priming on their wood-work is about one-half the thickness of the coat of whiting on one of our picture-frames; but of course it could be made thicker if necessary, and it would be useful to know, if the gilding over their priming could be burnished. In Siam most of the gold leaf used for gilding is imported from China, but the Burmese prefer to make their own, and they beat it far too thin, for it is full of holes and so requires to be doubled in many places, which not only leads to much loss, but prevents the gilding so smooth as the Siamese gilding. They mix a great deal of alloy also with the gold of which they manufacture the leaf, contrary to what Colonel Symes was informed; and hence the gilding of all Burmese pagodas and public edifices soon looks dull and shabby, particularly where exposed to the weather. Few remains can be now traced of the gilded Kyoungs seen by Colonel Symes at Amarapoora, nor is there any gilding now to be seen on the great Arracan gun. The splendour of the king's palace at Ava, although the gilding has not been executed more than 8 or 9 years, is not so great as it must have been when Mr. Crawfurd visited this capital; and the gilding of the Shivedagon pagoda, at Rangoon, now looks very black and shabby; whereas at Bang-kok, I recollect the Portuguese consul pointing out to me the excellent state of preservation of the external gilding of a pagoda, which was described to have been gilded no less than sixty years before*.

All the different purposes to which the *theet-tsee* is applied in this country, can scarcely be enumerated. It is *boiled*, and used for writing on polished tables of wood or ivory, particularly in the Pali character.

* Gold leaf is fixed on cloth or paper by the Burmese, in a very simple manner, with only the milky juice of the country fig, *Udambar* of Hindústan, (Ficus racemosa or glomerata,) called by the Burmese *Thaphanthee*.

The umbrellas of all classes are made with paper and two or three coats of varnish, over which, whenever required, gold leaf is easily put on in the manner above described. Almost all domestic utensils are made with this substance, and basket-work or wood. I should think very light portmanteaus or *pitarahs* might be made, by applying over a bamboo frame-work this varnish, and the *thayo*, which would fill up all the cavities, and render the articles impervious to water. Rattan might be too heavy, and the priming might not adhere so well to its polished surface. The *theet-tsee* would answer well as a preservative for the sides of ships and their standing rigging; I applied a coat of it, in the absence of paint, to the sides of some gun-boats, and found the material cheaper and much more durable than paint. By first applying a coat of the *thayo* or paste, the sides of a vessel might be made perfectly smooth and even, and impervious to water; and in this manner the Burmese finish their best war boats, which are afterwards gilded over if required*. It is necessary to mention, that the surface of the *theet-tsee*, when kept, is always covered with 2 or 3 inches of water, to prevent the varnish from drying or becoming hard.

Observing that Dr. Wallich had never seen the *theet-tsee* in flower, I requested Dr. Richardson, during his verland journey last year to the frontiers of Manipúr, to bring me a specimen. He passed through extensive forests of the tree, from a place called Mya-goo, about 5 days journey from Ava, to the Manipúr boundary. The trees were very large, and had a beautiful appearance from being covered with flowers so abundantly that the leaves were concealed, and the trees looked one mass of white. The bark appeared quite dry, and no juice was oozing at the little slips of bamboo which he saw sticking in the trunks of the trees. The flower has a fragrant scent, resembling that of apples, and the Burmese eat the young buds in *curries*. The wood of the *theet-tsee* is of the colour and appearance of the red wood of the Malay countries. It is much used, converted into charcoal, by blacksmiths and others requiring a very hot and quick fire; and it is used also for such little articles of furniture as the Burmese can boast of.

* Most of the lacquered ware is made round, in consequence of the convenience of finding the surface smooth on a lathe, but I have lately induced Burmese workmen to prepare articles of other forms, and they have begun to make ladies' square work boxes, and gentlemens' hats; which last will be useful in wet weather.

The account given under the article Japanning in Rees's Cyclopedia of the *varnish* used in China and Japan, "composed of turpentine and a curious sort of oil," and "of the *lack*, sap, or juice of a tree, occasioning swellings in the hands and faces of the people who use it," answers a good deal to the *Shan* oil and *theet-tsee*, here described; yet the Burmese workmen, upon examining a piece of japanned-ware of China, considered it to be made of a different material, unknown to them.

I send with this paper, specimens of the lacquered ware, and the different materials used in the manufacture.

For the convenience of reference, I have numbered the whole as follows. [The specimens are deposited in the Society's museum.]

1.—Basket work of a cup completed.

2.—First coat of *theet-tsee* put on, rim cut, and fine basket-work on the top scraped.

3.—A coat of coarse *thayo* applied inside and outside.

4.—Inside and outside ground on the lathe.

5.—A coat of fine *thayo* applied inside and outside.

6.—Inside and outside ground again on the lathe.

7.—Two coats of plain *theet-tsee* applied.

8.—A coat of *Hen-za-pa-de Yowé*, or fine vermilion applied.

9.—Polished with *Engyen* powder, after two coats of *theet-tsee*, and gilded at the bottom, to shew the Burmese style of gilding.

10.—The *Yowon T,ho* engraving, according to the *Shan* style.

11.—The *Yowon T,ho* engraving, filled up with *Hen-za-pa-da Yowé*—A coat of the semi-transparent mixture applied, and the specimen of *Shan* ware completed. But there was too much *theet-tsee* in the semi-transparent mixture, and hence the colour is too dark. The circular lines are coloured with the worst sort of vermilion, or *Hen-za-pa-da Gouk.*

12.—The *Burma D,ho* or engraving, according to the Burmese style, upon a coat of *Hen-za-pa-da Yowé.*

13.—The *Burma D,ho*, or engraving, filled up with yellow sulphuret of arsenic, or *tshé-dan*, and the specimen of Burmese ware completed.

14.—The *Burma D,ho*, or engraving, after 3 coats of *theet-tsee.*

15.—The *Burma D,ho*, filled up with green, or *atsein*, a compound of indigo and yellow sulphuret of arsenic.

16.—The first or finest kind of basket-work, called *Kyoung-lein-yet.*

17.—The third or coarsest kind of basket-work, called *Powet-kyoung-yet.*

18.—The second or middling kind of basket-work, with the form, or *poun*, on which it is woven.

19.—A course *Nyoung-oo* made *kwon-eet* or beetle box, supposed to have a priming of mud and cow-dung only.

20.—A fine *Nyoung-oo* made *kwon-eet*, or beetle box, such as is used by men of rank.

21.—An Ava-made *t,hamen-tsa ouk galé*, or small sized dinner-box, with conical top, before any *theet-tsee* is applied.

21½.—A ditto ditto, with a coat of *thayo* put over the wood, and ground smooth on the lathe.

22.—A ditto ditto, after the *thayo* or paste has been applied and ground smooth, and a coat of *theet-tsee* over all.

23.—A ditto ditto, completed, with the *Hen-za-pa-da* or vermilion applied. These small sized boxes, with conical covers, are used by the Burmese women in carrying food to the pagodas on sabbaths and holidays.

24.—A *Shan*-made *thamen-tsa ouk gyee*, or large dinner box, with conical cover, completed.

24½.—A *Nyoung-oo thamen-tsa ouk-gyee*, or Nyoung-oo large dinner box, showing the Burmese style of engraving.

25.—A *bhee-eet* or comb box, before any *theet-tsee* is applied, being a Burmese lady's toilet box, to contain combs, oils, scents and false hair, sandal wood, and Chinese white lead; which last is used to put small round beauty spots on the face, like patches of our court plaister.

26.—A *tset-khoun* or lathe, with a form or chuck fixed on it.

27.—A *tsee* or cylinder form, with a chuck joined to it.

28 and 29.—Two bottles of *theet-tsee* of the first kind, or *Ayoung-den Theet-tsee*.

30 and 31.—Two bottles of the second quality, or *Theet-tsee-Anee-byau*.

32.—A bottle of *Shan-Zee*, or Shan Oil.

33.—A packet of *Hen-za-pa-da Yowé*.

34.—A ditto of *Hen-za-pa-da Awa*.

35.—A ditto of *Henza-pa-da Gouk*.

36.—A piece of *Shwé-gan-gouk*, or stone.

37.—A ditto of *Kyouk-pyen-gwé*, or stone.

38.—A piece of *Engyen-gyouk*, or fossil *Engyen* wood, used as a polishing powder.

39.—A piece of *Teng-wa* bamboo.

40.—A ditto of *Myen-wa* bamboo.

41.—A ditto of *Shwé-zettau-gyouk*, or stone.

42 and 43.—A *Tsout* and *Gouk*, engraving tools.

44.—A Shan-made *kwon-ouk*, or beetle box with high conical cover, such as ministers and men of rank use at Ava.

45.—A fine Shan-made *Eet-gyee*, or large round box, shewing the *Shan* style of engraving very perfectly.

46.—A common *Nyoung-oo* made *Eet-gyee*, or large round box.

47.—A parcel of Burmese gold leaf. The Burmese usually divide their gold according to a decimal scale of *moos*—ten *moo* gold is supposed to be purest, and the inferior qualities are termed 9, 8, 7, &c. *moo*, or this specimen is said to be 8 *moo* gold.

48.—A parcel of *Phwé-bya*, or paddy husk ashes.

49.—A parcel containing some *hartal tshé-dan*, or yellow sulphuret of arsenic.

50.—A piece of *theet-tsee* wood.

51.—An Ava-made *hhwet-gyee*, or large cup, with a stand fixed to it.

52.—Pieces of bamboo, shewing how they are cut for weaving the basket-work.

II.—*Analysis of the Chinese Varnish. By* Mr. I. Macaire Prinsep.

[From the Memoirs of the Society of Physics and Natural History at Geneva, April, 1826.]

As a valuable appendix to Major Burney's account, we insert in this place, the translation of a memoir by Mons. I. Macaire, on the chemical nature of the Chinese varnish, which, if not identical with, does not much differ from that of Ava.

" The name of varnish was formerly given in the arts, to solutions of divers solid substances in appropriate liquids, susceptible of being spread easily over the surface of bodies, and by evaporation of the liquid of leaving a film of solid matter, more or less thick, to protect them from external influence. The essential qualities of a good varnish are, the formation of a continuous and smooth coat, not injurious to the texture or colour of a body; its rapidly drying and hardening, and finally its mixing well with different coloring ingredients. To these points artists have directed their attention; but although they may have succeeded well, their efforts have not yet surpassed nature, and the precious juice of which Eastern Asia possesses an inexhaustible supply, is as yet superior to the best artificial varnish.

The Chinese and Japanese had long employed this varnish, before we had any knowledge of it in Europe. The Missionaries sent to China, in the 15th century, were the first to give some crude notions of the nature of the coating found upon most of their works of art. In the 17th century, the Jesuits Martino, Martini and Kircher having spoken of it in more detail, a French hermit of the order of St. Augustin, father Jamart, found means to profit by the uncertainty of knowledge about Chinese varnish, and sold under this name a composition which he kept secret, and which, though certainly very different from the real varnish, had very much the appearance of it, and acquired general reputation in commerce. Many others sought to imitate or improve upon it, with combinations of balsams, gums, resins, volatile oils, &c., until at last father d'Incarville made known to the world, that the famous varnish employed by the Chinese to cover their furniture and utensils, was the natural product of a particular tree, which they called *Tsi-chu*, or varnish-tree.

Those who know with what vigilant jealousy the Chinese threw obstacles in the way of all intercourse with the people of Europe, will not be surprised at the uncertainty of data acquired by botanists, as to the name and locality of this precious tree, which has never yet been seen in Europe. Loureiro, who deserved the greatest confidence, because he alone had judged with his own eyes, inserted it as a new genus in his *Flora Cochin-Chinensis*, under the name of *Augia*, from *αυγη, splendor*. The generic characters given were, a small calix of a single piece, five oblong petals attached to the receptacle, a great number of stamina attached to the same point, ovary terminated by a style and an obtuse drupe flattened from the top, so as to resemble a lens, small, smooth, and enclosing within a pulpy envelope a similar flattened nut, having but one cell. Loureiro imagined there to be only one species, and that one the only tree which produced varnish; he called it A. Sinensis. It grows in Cochin-China, China,

Siam,—of a moderate height, its branches rise vertically and are furnished with *pennated leaves*, consisting of five pair of folioles entire, placed along a common petiole, terminated by a single one; the flowers are disposed on the summits of the branches, where they form panniculæ. To obtain the varnish, the bark is pierced, and a thick resinous juice exudes from the wound: it is either used pure, or mixed with different coloring substances. It is employed in India as a medicine, after boiling to deprive it of a very acrid volatile principle.

The Cochin-Chinese medical men administer the resin in pills, as heating, resolutive, emmenagogue and vermifuge. Upon this description, M. de Jussieu classed the genus *Augia* among the *Guttiferæ*, but Professor De Candolle remarked, that of that family there was not a single species with pennated leaves. The last character classes it naturally with the *Terebinthaceæ*, to which the chemical qualities of its juice also assimilate it; but according to M. de Candolle, the *Terebinthaceæ* never have the petals and stamina inserted in the receptacle. Mr. Lamarck refers the varnish tree or *Tsi-c'hu* to the Badamier, *Terminalia vernix*, of the family of *Myrobalans*; its leaves oblong, linear and smooth, deprived of hair, distinguish it from the other *Badamiers*. It grows in China and the Moluccas, it contains in every part a milky juice, of so caustic a nature as to render its exhalations dangerous, and contact with the plant more so. When the trunk is of sufficient size, this juice exudes spontaneously, or through artificial fissures; it thickens and becomes brown and altogether black, when it has acquired its utmost consistence. While yet liquid, the natives apply it to the articles known in Europe, as "lacquered ware." The caustic principle volatilizes while the varnish is drying; so that the vessels coated with it may be used for drinking with impunity. The seeds are even eaten, when roasted.

This description will not apply to the Chinese varnish, since this latter substance does not blacken in the air, and it is probable, that M. de Lamarck may have confounded it with the varnish of Japan, which is produced (according to Adamson) from a species of the Sumach tree, *Rhus vernix*. "This tree," says the naturalist, "is poisonous, and produces on the skin, as does the *R. Toxycodendron*, effects analogous to the symptoms of eresypelas. A white viscous liquor runs down from incisions made in the tree, which is caught in wooden baskets, and blackens in the air. It may be preserved in vessels covered over with an oiled skin, but it is far from equalling the varnish of China*.

M. Perrotet, returning from a voyage round the world, in 1823, sent a specimen of the Chinese varnish to Professor de Candolle, who kindly favored me with a portion for chemical examination.

The Chinese varnish is of a yellow colour, slightly brown, of a peculiar aromatic smell, of a strong taste, slightly astringent, affecting the back of the mouth, persistent; nearly resembling that of the balsam of Mecca or Copahu:

* Dr. Wallich has raised the Burmese varnish tree into a new genus, *Melanorrhœa*, and has pointed out the distinguishing characters of the several trees yielding varnish, (*Plantæ rariores* 12.) The coincidence of the Chinese, Japanese, and Burmese names *t,hi-tsi* need be no criterion of their identity, since the words merely signify *varnish-tree*, and would be applied to all that yield varnish. The resemblance between the *Angia* of Loureiro, the *Rhus Vernicifera* and the *Melanorrhœa*, are striking; it can hardly be said that the Burmese varnish turns black, it only appears so when very thick.—ED.

its consistence is viscous, like thick turpentine. It orms, when spread, a brilliant even surface, drying easily, and assuming a fine polish. It fixes well the colors usually mixed with it, as minium, cinnabar, lamp-black ; and forms good colored varnishes, which do not scale off when dry. To mark its difference from turpentine, varnish, and balsam of copahu, whose physical and chemical properties are otherwise so analogous, I ground up with the latter some of the same colors, but found that the varnishes thus made would not dry ; and after three months' exposure to the air, they still yielded to the finger, so as to be totally useless.

Poured into a vessel of distilled water, the varnish spreads upon its surface, in the form of a yellowish film, which by degrees absorbs water in its pores, and becomes white and completely transparent ; so that it may be said to be *hydrophanous*, like some particular minerals. Turpentine has not the same property, but the balsam of copahu has it in some degree: on straining the varnish it becomes opake, and soon grows yellow from the evaporation of the water it had taken up: the water acquires a slightly bitter taste. The varnish dissolves gently, in cold, and more rapidly in hot alcohol ; water precipitates from it an abundant white resin. It is also soluble in ether and in cold spirits of turpentine.

Digested in boiling water, the varnish whitens and resembles curdled milk ; its own peculiar odour is disengaged, and after long boiling, there remains a white resin, solid, brittle when cold, softening and melting in hot water, soluble in alcohol, in all proportions—whence water precipitates it in a white powder—soluble in turpentine, caustic potash, &c. Heated in a tube gradually raised, the resin gives out much water which it had dissolved : this water is strongly acid, and contains benzoic acid, as will be presently noticed. The resin deprived thus of the water it had absorbed, remains transparent and yellowish : when cold it is hard and brittle, softens and melts at the fire, and under a graduated heat gives out by sublimation white silky flexible crystalline needles of benzoic acid. Soon after a very acid water is disengaged, (acetic acid,) the resin blackens, and decomposition commences.

On examination of the water in which the varnish was boiled, we find that it reddens litmus, and has a slightly sour taste. Evaporated, it leaves a light residue soluble in alcohol, whence it is precipitable partly by water. This acid saturated with ammonia, acts with re-agents like the benzoic ; it must have existed in the varnish in a free state to be thus separated by simple boiling ; gum benjamin also and balsam of Mecca, when boiled in water, impart a marked acidity and of the same nature. To assure myself, that the acids so dissolved was positively the benzoic, (for I remembered that the Italian chemists had proved the existence of succinic acid in turpentines, and this might therefore be the case with the varnish) :—I first sought to recognise the differences between the two, and was surprised to find, that it was almost impossible to distinguish them. In fact they both melt and volatilize, leaving a carbonaceous residue ; both sublime in white, flexible, silky needles ; the remarkable property enjoyed by the succinates of precipitating iron of a yellow brown, and forming a soluble salt with manganese, which proves so useful in analysis, belongs also to the benzoates. They precipitate in the same manner the salts of lead, silver, tin, and neither of them affect antimonial solutions. These two only, of all the vegetable acids, dissolve without decomposition in nitric acid, and are recovered unaltered on evaporation. Sometimes, it is true, a few red vapours arise, and when benzoic acid is so treated, on evaporation

of the nitric acid, a marked smell of bitter almonds is perceived, although on saturation with potash, no trace of prussic acid is found.

Many chemists have inclined to believe in the identity of the two acids, and have attributed the slight differences observable to the presence of foreign matter. Nevertheless in seeking some method of discrimination, I have observed two circumstances in which the benzoic and succinic acids behave in dissimilar ways. 1. With the salts of copper, a very neutral solution of benzoate of ammonia gives a pale blue ashy precipitate, while the succinate furnishes an abundant curdled deposit of a fine green; neither of the acids alone precipitating copper. 2. With the salts of cobalt, the succinate of ammonia hardly disturbs the liquid, and it is only after a day that a rose coloured deposit is perceived, while the benzoate throws down a copious flocculent precipitate of a pale rose colour.

By employing these two tests, I ascertained that the acid extracted from the varnish acted like the benzoic. I should add that, when I treated with nitric acid the residue left by the evaporation of the water in which the varnish had been boiled, I obtained, besides the unaltered benzoic acid, a small quantity of oxalic acid, which I attribute to the presence of the little gum which had rendered the alcoholic solution opalescent, but which was in too small a proportion to be separated.

If the varnish is distilled in a retort with water, there passes into the receiver an essential oil, white, transparent, swimming on the water, of a strong scent, similar to that of the varnish itself, of a very acrid taste, disagreeable and persistent, having all the properties of other essential oils, without any apparent peculiarity.

Boiled with dilute sulphuric acid, the pungent odour of the varnish disappears, and an iridescent white pellicule forms on the surface of the liquid, giving to the vessel and liquid, by reflection, a fine blood red or purple colour; but on removal from the fire, the liquid is seen to be colourless. The pellicule may be skimmed off in scales: it is dry, insipid, soluble in turpentine, which it colours yellow; insoluble in caustic potash; it becomes brown in alcohol and ether, by degrees losing this colour and imparting a milky tinge on solution: on the addition of a few drops of water, the alcohol becomes sensibly acid; heated *per se* the purple matter softens, melts, loses colour, turns black, and reddens litmus strongly; heated in boiling distilled water, it is also discoloured without imparting any tint to the water, which becomes strongly acid; and the residue dissolves entirely in alcohol with the aid of a gentle heat. Water renders this solution milky, and this residue appears to be nothing but resin little altered. The solution shewed indications of acid, which, saturated with potash, dried and strongly heated, gave out an odour of sulphurous acid, one of the characteristic marks of hyposulphuric acid; the residue was merely sulphate of potash.

The purple matter therefore appears to be a compound of resin and sulphuric acid modified in its composition, and to be nothing therefore but another form of artificial tannin. This led me to imagine, that the artificial tannin produced by the action of sulphuric acid on resin should give analogous results; and in fact, sulphuric acid diluted with twice its weight of water having been mixed with colophony (resin) in powder, the liquid took a brown colour, and by the gentle heat of the sun disengaged sulphurous acid: the filtered solution evaporated and washed, presented all the characters of tannin. The excess of sulphuric acid having been separated by barytes, the liquid was evaporated, and the

salt disengaged by heat a smell of sulphurous acid, as an hyposulphate would have done. It appears to me, therefore, that we should consider artificial tannin as a combination of resin and hyposulphuric acid, which supposition is conformable enough with the facts that led to the discovery of this modification of sulphuric acid. Pounded resin digested with heat in very dilute sulphuric acid, does not however give rise to the purple matter: it merely takes a brown colour. Gum benjamin and balsam of copahu do produce it: turpentine does not: benzoic acid does not acquire a red colour under similar treatment.

It follows from the facts contained in this Memoir, that the Chinese varnish is composed, 1st, of benzoic acid; 2nd, of a resin; and 3rd, of a peculiar essential oil, and that it is only to the happy proportions of these three, and to the slight differences between their properties and those of analogous resins, that the Chinese varnish owes the superiority which renders it so precious in the arts."

III.—*Summation of Polynomial Co-efficients.* *By* Mr. W. Masters.

It is stated in most of the treatises on Algebra, that, if a binomial be raised to any power, the sum of the numeral co-efficients of the terms of that power is equal to 2 raised to the same power; but I have no where met with even a most distant hint of the proposition (which I am about to demonstrate) that, the sum of the numeral co-efficients of any power of a polynomial is equal to the number of terms in that polynomial raised to the same power. This is almost self-evident; for if a binomial $(x+a)$ be raised to any power, it is plain that the numeral co-efficients that appear in the developement originate not from x or a which are heterogeneous, compared with abstract numbers, but from $(1+1)$ the co-efficients of x and a; for while we develope $(x+a)$ we at the same time develope $(1+1)$, and the *figures* that appear represent a certain power of $(1+1)$.

(1) Let $(a+b+c+$ &c.), $(a'+b'+c'+$ &c.), $(a''+b''+c''+$ &c.), be m sets consisting of n things each. If one set be taken, and one letter from it at a time, the number of combinations will be n; and as the numeral co-efficient of each combination is 1, n likewise represents the sum of the numeral co-efficients of the combinations. Next, if one letter be taken at a time and two sets be used, the number of combinations $= 2n$; and since the co-efficient of each combination is 1, $2n$ also represents the sum of their numeral co-efficients.

If one letter be taken and three sets used, Cns. $= 3n =$ S. N. Cts.

If one letter be taken and m sets used, C. $= mn =$ S. N. C.

The co-efficients of n form the following progression:

1, 2, 3, 4, ... m.

(2) Now take two sets, consisting each of n things; combine them by taking one letter at a time from each.

$a'a + a'b + a'c +$ &c. (to the nth term) $= n$ combinations.
$b'a + b'b + b'c +$ &c. $= n$ ditto.
$c'a + c'b + c'c +$ &c. $= n$ ditto.

that is, each of the n letters of one set forms n combinations with the letters of the other set: the number of combinations is $n \times n = n^2$. Since the numeral co-efficient of each combination is 1, n^2 likewise represents the sum of their numeral co-efficients.

Next, let there be three sets, each containing n letters, taking two sets at a time, and one letter from each of those two sets at a time.

$a + b + c$ &c.	$a + b + c$ &c.	$a' + b' + c'$ &c.	There are only three possible ways of arranging three sets taken two at a time $\frac{3.\ 2}{1.\ 2} = 3$.
$a' + b' + c'$ &c.	$a' + b' + c'$ &c.	$a'' + b'' + c''$ &c.	

The first arrangement according to (2) produces n^2 combinations of letters; the second n^2 combinations also, and the third n^2 combinations, the total number of combinations $= 3\,n^2$, and for the same reason specified above, $3\,n^2 =$ the sum of the numeral co-efficients of each combination.

Next, let there be four sets, taking two at a time, and one letter from each as before.

The number of possible arrangements of four sets taking two at a time $= \frac{4.\ 3}{1.\ 2} = 6$; according to (2), each of these six arrangements produces n^2 combinations; the total number $= 6\,n^2 =$ also the sum of the numeral co-efficients.

Next, let there be five sets; then $\frac{5.\ 4}{1.\ 2} = 10$ arrangements; each produces n^2 combinations, the total number of combinations $= 10\,n^2 =$ also S. of N. C.

Next, let there be six sets, &c. &c. then $\frac{6.\ 5}{2.} = 15 =$ number of arrangements; each produces n^2 combinations, total number of combinations $= 15\,n^2 =$ S. of N. C.

Next, let there be m sets of n things: then $m\,\frac{(m-1)}{1.\ 2} =$ number of arrangements, the number of combinations $= m\,\frac{(m-1)}{1.\ 2}\,n^2 =$ also S. of N. C.

Obs. The co-efficients of n^2 form the following progression:

Series..... 1, 3, 6, 10, 15, ... $\frac{m\,(m-1)}{1.\ 2.}$

Difference . 2, 3, 4, 5,

(3) Next, let three sets combine at a time, by taking one letter from each at a time. This is equivalent to combining two sets together, as was done in the preceding section, and then combining the result with the third set, thus,

1st set $a + b + c$ &c.

2d set $a' + b' + c'$ &c.

Result $\overline{a'a + a'b} + a'c +$ . . . (to the *nth* term) $+ b'a + b'b \ldots$ (to the *nth* term) $+ c'a + c'b \ldots$ (to the *nth* term), &c. $= n^2$, combinations;

3d set, $a'' + b'' + c'' +$ &c.

$\overline{a'a''a + a''a'b} +$ &c. . . . . $= n^3$ combinations;

a'' forms with the result n^2 combinations; so does each of the n letters of the third set: therefore the total number of combinations formed $= n \times n^2 = n^3 =$ also sum of numeral co-efficients.

Next, let there be four sets; combine three at a time, by taking one letter from each of the three sets at a time.

$a + b$ &c., $a' + b'$ &c., $a'' + b''$ &c. the combinations to be formed thus—$a\,a'\,a''$, $a\,a''\,a'''$: since three sets out of four, are to be arranged together at a time, all the possible ways of effecting this, are

$\frac{4 \cdot 3 \cdot 2.}{1.\ 2.\ 3.} =$ four arrangements; now each arrangement according to (3) produces n^3 combinations: the total number of C. in this case $= 4\,n^3 =$ S. of N. C.

If m sets be taken, $\frac{m.\ (m-1)\ (m-2)}{1.\quad 2.\quad 3.} =$ number of arrangements;

and number of combinations $= \frac{m\ (m-1)}{1.\quad 2.}\,\frac{(m-2)}{3.}\,n^3 =$ S. of N. C..

The co-efficients of n^3 form the following series:

Series 1, 4, 10, 20, 35, 56, ... $\frac{m\ (m-1)\ (m-2)}{1.\quad 2.\quad 3.}$

Difference $\begin{cases} 3 \ldots . 6 \ldots . 10 \ldots 15 \ldots 21 \ldots . \frac{m\,(m-1)}{1.\ 2.} \\ \quad 3 \ldots . 4 \ldots . 5 \ldots 6 \ldots . \quad m. \end{cases}$

(5) Next, let four sets combine, taking one letter from each at a time, and forming combinations consisting each of four letters. This is equivalent to combining three sets, taking one letter from each at a time; forming combinations of three letters each, (as in the last section,) and then combining the result with the fourth set.

$(a+b+c+\ldots)(a'+b'+c'+\ldots)(a''+b''+c''+\ldots) = n^3$ combinations of three letters each, by combining $(a''+b''+c''+\ldots)$ with the preceding

a'' will form n^3 combinations of four letters each,

b'' will form n^3 ditto of ditto, . . . then terms of the fourth factor will form $n \times n^3 = n^4$ combinations of four letters each = S. of N. C. of these combinations.

Next, let there be five sets or factors, combining four at a time, and taking four letters from each at a time, then

$\frac{5.\ 4.\ 3.\ 2}{1.\ 2.\ 3.\ 4}$ = five arrangements of which the five sets are susceptible upon the condition required: but by the preceding result, each is capable of n^4 combinations of four letters each; the total number of combinations $= 5\,n^4$ = S. of N. C.

Next combine m sets: then $\frac{m\,(m-1)}{1\ .\ 2}\ \frac{(m-2)}{3\ .\ 4}\ \frac{(m-3)}{}$ = number of arrangements; total number of combinations $= \frac{m\,(m-1)}{1.\ 2.}\ \frac{(m-2)}{3.}\ \frac{(m-3)}{4}\,n^4$ = S. of N. C.

The co-efficients of n^4 form the following series:

Series	1	5	15	35	70	$\frac{m\,(m-1)\,(m-2)\,(m-3)}{1.\ 2.\ 3.\ 4}$
Differences	4	10	20	35	....	$\frac{m\,(m-1)\,(m-2)}{1.\ 2.\ 3}$
	6	10	15	21		$\frac{m\,(m-1)}{1.\ 2}$
		4	5	6		$m.$

Without going into any farther details, we may proceed to make deductions: arranging the results already obtained, they will form the following series:

1 2 3 4

$$m\,n,\quad \frac{m\,(m-1)}{1.\ 2}\,n^2,\quad \frac{m\,(m-1)\,(m-2)}{1.\ 2.\ 3}\,n^3,\quad \frac{m\,(m-1)(m-2)(m-3)}{1.\ 2.\ 3.\ 4}\,n^4$$

rth*

$$\ldots\ldots\quad \frac{m\,(m-1)\,(m-2)\ \ldots\ldots\ m-(r-1)}{1.\ 2.\ 3\ \ldots\ldots\ r}\,n^r$$

The generating fraction is, for

* rth means the rth term, as 2, 2, &c, mean the 1st, 2nd term, &c.

Term

2........ $\frac{m-1}{2}n$

3........ $\frac{m-2}{3}n$

4........ $\frac{m-3}{4}n$

r........ $\frac{m-(r-1)}{r}n$

Let N be the number of terms; the generating fraction of the $\overline{N+1}$th term $= \frac{m-\left\{(N+1)-1\right\}}{N}n$

Since the $\overline{N+1th}$ term $= o$, the generating fraction must $= o$,

Therefore

$$m-\left\{N+1)-1\right\} = 0 \therefore N = m.$$

That is, the number of terms is equal to the number of factors, or sets employed or developed.

The index of n therefore in the last term is m; i. e. in the last term n is n^m; as for the co-efficient of n^m, it is equal to the sum of the combinations that can be formed by combining m sets or factors, taking N sets at a time.

This sum is equal to $\frac{m(m-1)\ldots\ldots\ldots\ldots\ldots\ldots m-(N-1)}{1.\,2.\,3\ldots\ldots\ldots\ldots\ldots\ldots\ldots N} =$ (because $N = m$)

$$\frac{m(m-1)\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 1.\,2.\,3}{1.\,2.\,3\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(m-1)\,m} = 1$$

therefore the last term is $n^m =$ (S. of N. Co-efficients of all its combinations. As the first term has n combinations and the last n^m, the last but one, or the N—1th term will have n^{m-1}, and its co-efficient will be equal to the sum of the combinations of m sets or factors taken N—1 sets at a time $= \frac{m\,(m-1)}{1.\quad 2.}\ldots\ldots\ldots\ldots\ldots\ldots\frac{m-\left\{(m-1)-1\right\}}{(m-1)}$

$= \left\{\frac{m\,(m-1)\,(m-2}{1.\quad 2.\quad 3.\quad 4}\ldots\ldots\ldots\quad\frac{4.\quad 3.\quad 2}{(m-2\,(m-1)}\right\} = m =$ S. N. C. therefore the N—1th term $= m\,n^{m-1} =$ S. N. C.

$\overline{N-2}\ldots\ldots = \frac{m\,(m-1)}{1.\quad 2}n^{m-2}$ &c. &c.

$=$ S. N. C.

Since the foregoing formulæ for the number of combinations also represent the sum of the numeral co-efficients of each combination, these formulæ, considered as representing the sum of the combinations, will not at all be affected by the hypothesis that the n terms of each of the m sets or factors is the same, viz. that a', a'' &c. $= a$; b', b'' &c. $= b$; c', $c'' = c$ and so on: the formulæ will, under this supposition, continue to represent the sum of the numeral co-efficients.

Now let it be required to develope m sets or factors, each consisting of n things or terms; viz.

$(x + a + b + c$ &c.$)(x + a' + b' + c'$ + &c.$)(x + a'' + b''$ + &c.$)$ (&c.) it is plain, that the developement will be

$X^m + A\,x^{m-1} + B\,x^{m-2} + C\,x^{m-3} + D\,x^{m-4}$ ..... $Y\,x^2 + Y\,x + Z$. Here it is evident, that,

$A = (a + b +$ &c. $a' + b' +$ &c. $+ a'' + b''$ + &c.$) =$ the sum of the combinations of m sets of n letters each, one set taken at a time, and one letter from that set at a time; $=$ (as is shewn above) the sum of $m\,n$ combinations of one letter each.

$B = (a\,a' + a\,b' +$ &c. .. $a\,a'' + a\,b'' +$ &c. .. $a'\,a'' + a'\,b''$ &c.$)$ $=$ S. of the combinations of m sets of n letters each, two sets taken at a time, and one letter from each of these two sets taken at a time; $=$

S. of $\frac{m\,(m-1)}{1.\ 2.}\,n^2$ combinations of two letters each.

$C = (a\,a'\,a'' + a\,b'\,b'' +$ &c. $b'\,a'\,a'' +$ .... $a'\,a''\,a'''$ ..&c.$) =$ S. of the combinations of m sets of n letters each; three sets taken at a time, and one letter from each of these three sets combined at a time) $=$ S.

of $\frac{m\,(m-1)\,(m-2)}{1.\ 2.\ 3}\,n^3$ combinations of three letters each.

$D =$ S. of $\frac{m\,(m-1)\,(m-2)\,(m-3)}{1.\ 2.\ 3.\ 4}\,n^4$ combinations of four letters each.

$Z =$ S. of the combinations of m sets of n letters each, taken m sets at a time, and one letter from each at a time $= 1 \times n^m = n^m$ combinations of m letters each.

$Y =$ S. of the combinations of m sets of n letters; taken $(m-1)$ sets at a time, and one letter at a time $= m\,n^{m-1}$ combinations of $(m-1)$ letters each, &c.

Now, if we suppose $a = a' = a''$ &c. $b = b' = b''$ &c. $c = c' = c''$ &c. $m\,n$ will represent the sum of the numeral co-efficients in A; $\frac{m\,(m-1)}{1.\ 2.}\,n^2$ the sum of the numeral co-efficients in B; therefore the sum of the numeral co-efficients is in

X 1

$A\,x^{m-1}$ ..... $m\,n$

$B\,x^{m-2}$ ..... $\frac{m\,(m-1)}{1.\ 2}\,n^2$

$C\,x^{m-3}$ ..... $\frac{m\,(m-1)\,(m-2)}{1.\ 2.\ 3}\,n^3$

*..... .....

Y x ..... $m n^{m-1}$

Z..... n^m

therefore the sum of the numeral co-efficients in the expansion $x^m + A x^{n-1} + B x^{n-2} + C x^{n-3} + \ldots\ldots\ldots Y x + z'$ is

$$1 + m n + \frac{m(m-1)}{1.2} n^2 + \frac{m(m-1)(m-2)}{1.2.3} \ldots\ldots m n^{m-1} + n^m.$$

But this series is evidently the expansion of $(1 + n)^m$ = (number of terms in each factor)^m: therefore the sum of the numeral co-efficients of any power of a polynomial is equal to the number of terms in the polynomial raised to the same power.

IV.— *Geological Sketch of Masúrí and Landour in the Himalaya; together with an Abstract of the Thermometrical Register kept at Landour during the year* 1831. *By* F. H. Fisher, *Assistant Surgeon.*

The characteristic features of the primitive clayslate formation at Landour correspond so completely with those of similar districts in Europe, and tend so decidedly to favour the received geognostical arrangement of mountain rocks, that no one can survey them without strong feelings of interest and surprise; recognising at such remote distances the objects of early research and attention, and confirming as it were the result of former inquiry.

Viewing this mountain from the Dún, its general aspect at once determines its internal composition; the gentle acclivity, round-packed summit, and plentiful vegetation, indicating clayslate; its height, calculating above the level of the sea, is supposed to be about 7000 feet, and its length ranging from east to west may perhaps average a mile; seldom affording a breadth on cleared sites of more than 100 feet.

Throughout this range, instances of some of the accidental rocks, peculiar to the primitive clayslate formation generally, occur.

Before describing these intruders, which appear to have thrust themselves perversely across the regularly disposed strata of the clayslate, it may not be foreign to note, as briefly as opportunity has afforded, the rocks which appear in the hilly route from Rajpúr to the Landour bazar†, assuming the site of the latter to be somewhat above the acclivity of the mountain.

† The convenience of geologists having been considered as little as others in the plan and construction of this route, any attempt at systematic arrangement must

Ascending from Rajpúr the road is cut through a bed of bituminous slate, passing through alum slate of a bluish green colour, both of which are much decayed, and then traverses clayslate of a faded red colour; black limestone next appears, frequently intersected by flinty slate and Lydian stone: about a quarter of a mile below Jerìpanì large beds of primitive gypsum* with earthy sulphate of lime occur, and this may be considered the commencement of the Masúrì limestone formation. The road continues with slight variations in a westerly direction, and displays huge beds of grey limestone with one remarkable tract of calcareous tufa; after which clayslate re-appears, generally much indurated, iron-shot, and containing beds of flinty slate, with irregular nodules and schistose veins of brown clay iron ore. The colour of the clayslate now passes into faded red, and running in a northerly direction the road leads to Landour, leaving the Masúrì range to the westward.

The whole of this Masúrì range is composed of huge masses of stratified limestone, inclining at a gentle angle to the east, presenting occaionally considerable breadth of summit, but never approaching the height of Landour. In colour it is of a bluish grey, passing into black and white, highly crystallized, and well suited for ornamental purposes; it yields excellent lime, but the natives are careless in the preparation of it.

The aspect of Masúrì may still assert its claim to the picturesque, notwithstanding the merciless ravages of the woodman's axe amongst its withering beauties; precipices abrupt and imposing, moss-grown cliffs luxuriating in foliage, or nourishing creepers of the most lovely hue, must ever arrest attention, and steal admiration from the idlest observer. The simple minerals discoverable in this formation, are calcareous tufa, frequently iron-shot; calcareous sinter, white, brown, and yellow; calcareous spar in the primitive form; and sulphate of barytes; nodules of noble serpentine associated with hornblende slate, glassy actynolite, and earthy gypsum.

Leaving Masúrì and passing through the Landour bazar by the road

necessarily be abandoned; mention therefore can be merely made of the various rocks as they occur in succession, without reference to strict geognostical situation. The distance included in the route is about five miles.

* I consider this to be primitive from the considerable masses which occur; it varies in colour from brown to the purest white, the latter variety being highly crystalline; emits a strong smell of sulphuretted hydrogen when fractured; the same odour is perceptible in the water drawn from the stalactitic cave near Rajpùr. In large doses this water is but slightly cathartic.

above alluded to, we ascend by a small patch of grey limestone, and set foot on the clay slate of Landour*.

It is of a faded red colour, frequently passing into black, bluish black, greenish grey, and light brown, disposed in large slates, inclining at a considerable angle in an easterly direction ; it is occasionally waved in its structure, and in the red varieties cleaves easily in the parallel of the stratum, presenting a glittering surface, owing to small particles of imbedded mica. The black and bluish black varieties do not yield so readily to the hammer ; they are tough, afford irregular fragments, and cannot be adapted to the purposes of roofing. The accidental rocks which occur in this formation may be thus enumerated : granular quartz rock† ; felspar ‡ ; flinty slate and limestone §.

They are all unconformable, crossing the clay slate at right angles, and dipping to the north.

Abstract of a Thermometrical Register kept at Landour from the 1*st of January to the* 31*st Dec.* 1831. *Thermometer kept in an open verandah facing the N.*

	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Max.	47°	48°	64°	76°	85°	86°	70°	72°	69°	70°	62°	50°
Min.	31	31	40	44	60	60	61	59	54	51	42	30

V.— *On Modes of obtaining Important Results by Simple Means, By* Capt. G. Twemlow, *Bombay Artillery.*

[Continued from page 70.]

2.—*Easy mode of casting masses of simple metals without the aid of furnaces.*

The native mode is to surround the mould (sunk in the earth) by a fire capable of keeping it hot, then to employ as many assistants with their small earthen pans, and hand-bellows, as may be necessary to fuse the requisite quantity of metal ; in this way it would not be difficult to cast a pillar of large dimensions, taking the precaution to have the mould strong, well bound and supported, the fire around it sufficiently intense, although properly covered in, and the assistants in sufficient numbers to melt the metal, and pour it into the mould, kept hot as long as requir-

* Landour is separated from the snowy range by intermediate zones ; they all run parallel.

† Concretions not exceeding the size of a pigeon's egg, and of a milky hue, as seen on the site of the new Hospital.

‡ Compact felspar of a greyish colour, distinctly stratified, slaty in the small, and by the aid of a glass small acicular crystals of hornblende may be sometimes discerned ;—cleared site near Mr. J. Lloyd's grass hut.

§ But sparingly found of a pink colour, coarse in structure, and rather tough ; —site of the tennis court.

ed, to enable them to fill it. This mode it is evident would not answer well for mixed metals, nor for metals difficult to fuse. The writer casts his 18 pr. brass naves in this mode, each man bringing his seer of molten metal and pouring it out of earthen pans into the mould, kept surrounded by fire; and he has no doubt but a brass pillar or statue of one thousand seers in weight, might be cast in the same simple mode, by a series of circles of a thousand pans and a thousand bellows surrounding the fire-embedded mould,—not that we would adopt the pans, having a knowledge of furnaces.

3.—*Strength of powder may be too great in mining.*

A curious instance of simplicity on the part of natives, leading to useful results, may be mentioned relative to the operation of blasting rocks: the miners represented, that the government powder was not of the proper kind; that it blew out the tamping, without moving the rock, or if a very small quantity were put in, no effect was produced; whereas the common country powder was excellent; with it they could make great progress, but not so with the government powder. On going to the spot, this was speedily remedied by mixing one handful of saw-dust with each charge or handful of powder, so as to decrease the velocity of ignition, and to admit of the expansive fluid acting on greater space. It is believed that in mining operations generally it would be well to mix saw-dust with the powder, when a sufficient chamber can be formed, *or to adopt some other* mode of producing gradual expansion and reiterated concussion.

4.—*Mode of boucheing iron Guns, at a siege, or on emergency, without the aid of a regular drill lathe.*

Should the vent of an iron gun become so much enlarged as to be unserviceable, before a siege has been brought to a favorable termination, a new vent may be applied on the spot, thus; let the gun be withdrawn from the battery, and be thrown down close to the nearest convenient tree; and fixed on a block at the proper angle: insert a stout trunk of another tree in the ground six feet apart from the standing tree; pass a stout flat lever bar from one to the other, fixing one end to the standing tree, but so as to move up and down on the smoothed front of the other or inserted trunk: thus we have a simple boucheing machine or drill lathe.

In the mean time, the train artificers will have bent an axletree, or any other convenient piece of iron, into the shape and form of a brace, whilst other smiths will have forged out a four-cornered square cutting tap; with this square tap inserted in the brace, the artillery men may be set to work to enlarge the injured vent. The smiths mean time are

to be set to work to forge the screw tap for cutting out the female screw. Others will beat out the cold iron rod for the male screw, which is to form the vent.

When after successive enlargements of the female screw in the gun metal, it is brought to fit exactly the male, the latter is to be turned in screws with the requisite force to make it amalgamate with the gun metal, particularly in the lower two-tenths, which should purposely be left rather tight.

It is believed, that the chief thing to be looked to in boucheing iron guns, is to secure a very firm fixture below, by leaving the last two-tenths of the female screw tighter rather than the rest, so that force may be used to make the male screw bite into it.

We are told that guns have now spare screw vents for insertion on demand; but is it not probable that if the first screw is destroyed by intense heat, that the gun metal around it will have run, proportionately? In fact it admits of doubt, whether when a screw vent is destroyed by hard firing, it can be extracted by other mode than boring it out with taps and a brace.

5 —*To make fuzes on emergency.*

It has occurred that a bombardment has been stopped for want of fuzes in the shells, and that have been sent for, express, from the nearest magazine—the following plan of making fuzes on emergency might be of use in such a dilemma.

Procure some battery planks or any thick wood of two or more inches in thickness, according to the length of the fuze required;—stretch a carpenter's marking line along the centre of the smooth plank, and mark a line the whole length; parallel to that line, and on each side of it, draw other lines at the requisite distances for the thickness of the fuzes—on those lines bore holes (with a brace, auger or *burmit*) as deep as the fuzes are required to be long; and having the fuze composition ready, drive it into the holes; cut off the fuzes, wrasp them, and send them into battery for use; there is no reason why they should not be as good fuzes as need be, provided the composition is properly prepared and driven.—Persons who have to blast rocks may in this way make fuzes, wherewith to ignite their mines; for composition they should use mealed powder and charcoal.

6.—*Simple mode of quickly obtaining a light on service.*

Tear off a bit of cloth, moisten it in your mouth, put it into a pistol over a small charge of loose powder, fire the cloth against a bank, or ground, and the rag will give you a light.

7.—To set fire to combustibles with musketry.

Cast (in a greased piece of old musket barrel) solid cylinders of lead. Cut them into lengths of one inch; bore a hole in each to within two-tenths of an inch of the opposite end. Drive meal powder or other composition (according as the burning is required to be quick or slow) into the holes after the manner of fuzes, and when the composition has been driven to within one-tenth of an inch of the top, pass a strand of quick match transversely through the sides, as is done with fuzes.

These fire slugs fired horizontally will set fire *to whatever retains them;* or if fired at an angle will fall burning, if the composition is appropriate.

In Europe, rifle shells and other inventions are under trial, for setting fire to artillery ammunition waggons, and to other combustible machines. It is probable that the above is as simple and effectual a mode as could be managed with infantry; and in street combats might be made very formidable. If such weapons come into general use, artillery will be obliged to have their ammunition boxes made (as in fact it might be well if they were now made) *cellaret fashion**, to admit of the interior tier or row of holes being filled with shot or other resisting non-combustible material (even earth would do), to protect the powder which would be placed in the centre.

8.—Simple Alarm bell for private treasure or plate chest; or for public treasure tumbrils, to prevent the necessity for double sentries.

Sling a bell inside the chest, so attached to the lid that it cannot be got at from the out-side, and may have room to swing free. An attempt to force the chest or remove it will inevitably cause the bell to sound an alarm, and if it does not deter the depredators will give the master time to defend his property, or the guard to turn out.

VI.—*State of Science in England.*

To the Editor of the Journal of the Asiatic Society.

SIR,

Having felt much interested in the discussion which has for some time been maintained in the scientific journals at home, respecting the decline of science in England, I take the liberty of sending you a few observations on the subject; which, if they should not be deemed too presumptuous, you would oblige me by inserting in your valuable Journal.

* In making cellaret fashion ammunition boxes, the partitions should be put in from below in grooves; the bottom of the box to be afterwards screwed over them and well clamped—it is a safe mode of carrying fixed ammunition.

In Dr. Brewster's Journal for October, which I have just received, there is a somewhat tart critique upon a pamphlet written by a foreigner, and prefaced by Mr. Faraday, on the subject I have mentioned; and by it my attention has been particularly excited. This foreigner comes forward in defence of the scientific men of England, against the allegations of Sir H. Davy, Messrs. Babbage and Herschel, Sir J. South, and others: and it seems sufficiently rash for a foreigner to enter the lists with natives, or for any man to dispute the testimony of witnesses so competent, upon such a subject. Indeed it appears absurd to impugn their evidence upon any ground whatever, whether of motive, capacity, or actual information. Yet there may be no absurdity in inquiring, what the real amount of their testimony is. And I cannot but think there is something radically delusive in the phrase, "*Decline of Science in England*," which has been adopted to express the conclusion to which their depositions lead. For surely it could not be intended, that there is a literal decline of science in England, in such a manner that any thing previously known or acquired has been lost, or is beyond the reach and attainment of the present generation of our scientific men; or that the circle illuminated by scientific information and accomplishments is contracted, and the votaries of science in England are decreasing in numbers. No one would credit such testimony, by whomsoever it was advanced. But in what other sense can there be said to have been a decline of science in England, unless it be that there is not the same progressive activity in science which there was some little time ago? Now if this be the decline of science meant, we may—nay, I suppose, we must—admit it. But in what is it either wonderful or alarming? It is in strict analogy with all other strenuous movements. They have their irresistible impulses with succeeding pauses, in which strength is gathered for new and still stronger efforts. What have we lost that has brought us up to the present point of scientific progression? The human mind in Great Britain has not yet given any symptoms of dotage. Its powers remain in their full strength. And there are now multitudes in their cradles, and multitudes more unborn, who will bring to scientific inquiry as acute penetration, as profound abstraction, and as inventive a genius as any of their forefathers. The original faculties, by the exercise of which science is to prosper, are unscathed; and the facts which we are now slumbering over, will, in due time, strike on the minds of those who are to be our future Newtons, or Davys, or Herschels, or Babbages, or Brewsters, and enkindle glorious conceptions to dazzle succeeding generations by their splendour and majesty.

When thought is free, these are things that will neither come nor go at the bidding of state patronage.

I would not question a single fact alleged by the eminent men who originated this controversy. Nor can they be blamed for calling public attention to the decline, (if it must be called so,) which they deplore. On the contrary, they are much to be praised, and some of the admonitions they have given, deserve the most attentive consideration. Yet the general scope of their remonstrances and their recommendations does appear not a little at variance with philosophical character. "Science languishes for want of royal patronage, rich emoluments, and ribbons; stars, garters, and noble titles: let it have these, and it will be sure to prosper." Such is, I think, no unfair representation of much that they have advanced. Now these gentlemen are not of opinion, that England is in a state of original ignorance and destitution of science, but that it has merely sustained a relapse from allowed and indubitable eminence. They feel that but a short time ago, she possessed a galaxy of great men, which enabled her to enter into no dishonorable or unequal competition with all the science of the world; and their wish simply is to see her again invested with an equal glory. Upon the principle, that like causes produce like effects, one would have thought they would not have propounded the notions they have. For, observe the names which are adduced as lately the glory of England, and the loss of which has been the "death-blow to English science." They are "Sir H. Davy, Dr. Wollaston, Dr. Young, Mr. Watt, Dr. Marcet, Mr. Gregor, Dr. John Murray, Mr. Chenevix, and Mr. Smithson Tennant." And which single individual of all these was indebted in the slightest degree to royal patronage, or public endowments, or the ambition of rank and titles, for one tittle of his fame or usefulness? Indeed the inquiry, applied to them singly, becomes absolutely ludicrous.

We have had science then, by the safe and sure operation of knowledge gradually spreading over the minds of our countrymen We have already by experiment ascertained the natural history of scientific discovery; the causes and the developments of its growth. We know it to be certain, that if the seeds of science be freely scattered by the winds, they will find their proper soils and localities, and come forth in a rich and natural harvest.

Why then should we reject or despise what has been established by such proof? and still more strange it is, to recommend the cultivation of science, by means with which it has no affinity. What kind of genius is it that is to be expanded by places, pensions, and titles? Are scientific

men envious of the brilliancy of Poet Laureate rhymes? Or worse, would they have science, too, oppressed with the administration of a plethoric hierarchy? Would they fatten it into indolence by inalienable endowments? Or would they disturb its serene atmosphere by the storms of rivalry and ambition after secular preferments and distinctions? It is most marvellous, that of the two noblest and purest things in the earth, religion and science, we should be told, on such high authority as Lord Plunkett in the one case, and Mr. Babbage in the other, that they will not exist unless nourished with *money*—they will have no brightness, unless tinselled with the gewgaws of a vain life. Such a sentiment ought to be scorned.

No civilized government can carry on its operations without patronizing science, for the single reason that it needs both its men and its materials. They are indispensable in innumerable ways for the efficiency of its army and its navy, for its surveys at home and abroad, for its mint, and for many other purposes: and in these things all kinds of science are brought into requisition. This sort of patronage is wholesome; and we have only to wish that it were more wisely distributed. But there appear to be some who would attach rather curious functions to Government, as the great patrons of Science and Art; functions which would require a peculiar Board for the purpose of pensioning all savans, painters, and poets, whose wits cannot keep them; and investing with baronetcies, or lordships, or earldoms, or dukedoms, men who ought to thirst for such things as the glory of discovering the alcaline metals, or shewing a list of 700 double or treble stars, or producing the calculating machine. As I have said, a civilized Government must of necessity patronise science, and Governments must likewise be the greatest patrons of science; but I cannot see that they are under any obligation to dispense a gratuitous patronage, or that they would do any thing but harm by such a thing. Because of their responsibility to those whose money they spend, they are bound to require a *quid pro quo* in every part of their expenditure. Government is the greatest individual patron of science, but if the community do their duty, their combined patronage will throw that of the most liberal Government almost into insignificance; and it will flow through a thousand channels which no state patronage could have reached, and where alone the coming Davys, and Watts, and Murrays, and Tennants, are to be found and nourished.

Let scientific knowledge continue to be industriously diffused; and it will awaken the energies of such men as Sir James Hall and Sir J. South, and many others who might be mentioned, whose place it is to patronize, not to ask patronage: or if it fails to do this generally,

it will at least produce in men of property that sympathy for the objects of scientific men, which will ensure them the means of applying all their faculties to the best advantage. All wealthy men are as much bound to dispense a portion of their revenues in the promotion of science, and in every other noble and generous enterprize, as the Government under which they live. Let them therefore be called upon to rouse themselves for the more extended performance of this duty. And let those who enjoy such honours and emoluments as science already possesses, shew by their superior diligence and success, that there is some virtue in the secular advantages which they possess, raising them as scientific men above those who are destitute of them, before the dangerous experiment be made of increasing such stalls and dormitories.

There appears to me something so portentous in this matter, that I should like to see it fully discussed upon principles that approve themselves to sound reason. But I must leave it to abler hands.

I am, Sir, &c. &c.

J. MACK.

[On this subject we refer our readers to the valuable remarks of M. Biot, inserted among the Scientific Intelligence of the present number.—ED.]

VII.—*Memoranda regarding the Difference between Morning and Evening Altitudes, for Ascertaining the Apparent Time on board ship. By* Captain D. Ross, *Marine Surveyor General.*

With most navigators, when quitting a port, it is usual to ascertain the deviation of the chronometer from mean time by altitudes of the sun taken either on shore with an artificial horizon, or by that of the sea from on board ship. These altitudes are generally taken before noon, and seldom, I believe, is the deviation of the chronometer ascertained by altitudes taken in the afternoon; but from the long experience I have had, I am led to believe, that to approximate to accuracy, it is right that altitudes should be taken on each side of the meridian at the place of departure; for it will be found that in cases where the difference of longitude between it and a distant station is to be measured, if the result of altitudes taken at the latter in the afternoon be compared with those taken in the forenoon at the point of departure, they will frequently give a longitude differing two or three miles from a deduction of the same measurement made by comparing two forenoon observations together, and in such cases, there may be an uncertainty to that amount, in fixing the position of a rock or other danger. If at the point of

departure the deviation of the chronometer is ascertained by both morning and evening observations, and these be compared with altitudes taken at the new station, corresponding as to the time of the day, the results if not agreeing will differ but little.

On one occasion I found a difference of the nature alluded to above amounting to eight miles; for I anchored off one of the Piscadare Islands, near Formosa, and at about 8 h. A. M. took several altitudes for the chronometers, after which we proceeded nearly west from the anchorage, apparently 16 miles both by log and by the distance of the Island from us; we then anchored, and at 3. 30 P. M. the result of several observations taken and compared with those taken at 8 A. M. placed the ship but 8 miles west of the anchorage, when it was quite evident we were at least double that distance. Thinking these observations might be faulty, I took several others, but at about 5 P. M. and the results of the latter corresponded so nearly with those taken at 3h. 30m. P. M. as to satisfy me that the difference did not depend on error in the observations, and made me continue at anchor until the next morning, when observations were again taken and compared with those made the previous morning at the anchorage near the Island; they gave our difference of longitude 16 miles, agreeing with the log and apparent distance of the Island from us; here was an instance in which had not the island been in sight, I should have laid down a danger 8 miles short of what it should be, and should undoubtedly have attributed the difference to the effect of a current setting against us.

It is well known that in straits or confined navigation, owing to the changes which take place in the horizon, correctness is scarcely attainable in observations taken on board ship: I have often found it so, and am of opinion, that in the vicinity of shallow banks, the result of observations taken on ship board will be also generally found much at variance.

In the instance I have just stated, the bottom to the westward of the ship was formed by several ridges of sand lying in a north and south direction, having 7 or 8 fathoms water on them, with deeper channels between.

The part of the horizon above which the sun's altitude was measured was remarkably bright, and I have thought that some unequal evaporation might have caused the horizon to appear higher in that quarter.

I have found that observations taken in the vicinity of Ságar were not to be depended on, although there is apparently a clear horizon before you.

Latitudes taken afloat with much care will never agree with those taken on shore with an artificial horizon, and when the sun is to the

southward, will always be found more southerly by a mile or perhaps two.

I think there is little doubt, but that we need some correction for the mutability of the horizon at sea, and that probably its amount might be ascertained by a series of observations with the dip sector, and a close attention to the state of the atmosphere : my own experience leads me to the conclusion, that equal altitudes observed by the horizon of the sea without this check on board ship, are always subject to errors of an irregular nature.

VIII.—Scientific Intelligence.

1.—*Mr. Alexander Ksoma de Körös.*

The Viceroy and several noblemen of the Hungarian dominions, having learnt that Mr. de Körös, their countryman, was travelling in the East for the prosecution of researches connected principally with the origin of the language and people of Hungary, voluntarily subscribed £140 for the furtherance of his enterprising object. The money has just been received through a mercantile house in Calcutta, along with a handsome letter from the Baron Niumann, Secretary of the Austrian Legation at London. Mr. de Körös however has declined accepting it in the shape of pecuniary assistance to himself, and has been only induced to retain it, on the persuasion of his friends, for the purchase of Oriental manuscripts for the library of one of the principal universities of his native country.

2.—*Húgli Ice Manufactory.*

It may not perhaps be uninteresting to some of your readers to know the result of the experiment for keeping ice, and the reason of the late sudden failure of the supply. This is in part to be explained by the last having been an unfavourable season for the manufacture, so that although great preparations were made, the quantity obtained was by no means commensurate with the money expended ; and so peculiar are the agents to be provided against, in this hot climate, that in our present state of knowledge, experience alone can guard against their influence. That experience in a certain degree may be supposed to have now been obtained, and next year it is hoped, from additional preparations for its production, and precautions for keeping it, a supply of ice may be expected during a much longer period than has hitherto been known in Calcutta. The advantage that ice affords for cooling water, wine, &c. and the simplicity of the means to be employed for obtaining its full effect, must be already known to most of your readers ; but I suspect the cheapness of the luxury has not been properly appreciated, from the ignorance or carelessness of servants to whom its management is too often left. I have frequently had opportunities of observing this, and even the possibility of its not always accomplishing the object becomes apparent, when I have found servants, who had observed that it ought to be kept *warm* (surrounded with blankets), thrust it into warm water, the better to insure the keeping of the precious deposit. If care be taken to have it kept in a hard lump, and surrounded with blankets, it keeps very well for 12 hours,

during a hot day; and when used skilfully, the following I find to be the quantity required for reducing the temperature.

	Ice.	
Claret, French bottle..... Water,..... ditto..... Soda Water, stone ditto.	3 chitaks.	as cold as can be drunk.
Sherry, in English ditto, ...	4 chitaks.	
Jelly, in a large wide mouthed glass bottle.....	4 ditto	hard.
Butter, 1 chitak to 4 of butter.....		ditto.

W.

3.—*Mergui Dye Wood.*

Several specimens of a red wood were lately sent to Mr. G. Swinton, by Mr. Maingy, Commissioner on the Tenasserim coast, with a view to its examination as a dye wood. The *Rebecca*, on which the first samples of the plant were shipped, having been burned, nothing was then known of the tree. It was stated by Mr. Maingy, to differ from the *Theet-tsee* or Burmese varnish tree, which is also used in dying clothes of a red color. The effects of the juice of the red wood tree were described as similar to those occasioned by the *Theet-tsee*. The Burmese were said, when employed in collecting the wood, never to fell a tree for that purpose, but to search for trees that have been blown down, and in which no sap is to be found. It only bears seed once in 7 or 8 years: the Burmese do not extract the dye (probably from their having another tree which yields it in great abundance). The same tree is said to abound in Penang, but there the wood is red throughout, and is constantly employed as a dye by the Malays and Chinese.

A number of experiments made at the request of Mr. G. Swinton, by Mr. Thomas Speir, upon the Mergui dye wood, prove that it affords, with the mordants commonly used by dyers, colors equally bright and of a more permanent nature than those of most other dye woods. On the other hand, there seems a material objection to its success in the small quantity of coloring principle it contains, as compared with the generality of other woods and roots now in use: and it appears that the color is only found in trees of full growth, and only in the heart of the wood; the young trees are of a white or light straw color: indeed the branches of grown trees are white and the stems also, until their size exceeds that of the human body. The colors imparted to silk with different mordants were as follows:

1.—*Muriate of tin, sp. gr.* 1.185, *with* 5 *parts water.* Three shades of orange, varying with the temperature of the bath and the time of immersion.

2.—*Acetate of alumina, sp. gr.* 12. *of Twaddle's Hydrom.* Two shades of flame color.

3.—*Acetate of iron,* 7½ of ditto. Two shades of drab.

4.—*Ditto, with a weak decoction of galls.* A fine black, two shades.

5.—Mixed with *manjit*, a variety of red and pinks are obtained, but not perhaps equal in intensity to those of the *manjit* alone. The chief attraction of this wood as a dye, is the orange color which it yields with the aid of muriate of tin and acetate of alumina, of a great variety of shades.

These results shew that the Mergui wood is deserving of further attention, and that it may become eventually an important article of commerce with our posses-

sions on the Tenasserim coast. A small quantity of the wood has, we understand, been sent home to the Honorable the Court of Directors, for the purpose of being examined as to its dying properties, compared with other known dye woods.

[From duplicate specimens of the wood, leaves, and seed just received, it turns out that the tree in question is the *thit-tsi* or varnish tree, *melanorrhœa usitata* of Wallich: the above notice of its properties as a dye forms however an addition to our knowledge of the tree.—ED.]

4.—*Decline of Science in France.*

In the *Journal des Savans*, Jan. 1831, is a note by Professor Biot on the subject of Mr. Babbage's reflections on the supposed decline of science in England. He deprecates the fatal example which has been set by a man of such distinguished talent, in decrying the institutions of his country, and introducing dissentions among those who should be occupied in fortifying the bulwarks of science, while he gives arms to her numerous enemies, always ready to ridicule and undermine her jealous ascendancy. The example has already been followed by other illustrious men, with the augmented bitterness of personal controversy; and a torch of discord is introduced among the combustible materials of our scientific bodies, which neither the late distribution of titles and pensions by the Government, nor the establishment of Associations for the promotion of science in different parts of the kingdom, can now extinguish*.

M. Biot concurs in lamenting the neglect which such men as Dalton, Ivory, Young, Brewster, and Herschell, have suffered from their country; and grants that the abstract sciences have with us been abandoned for the more attractive paths of popular knowledge, the sure roads in England to preferment in the church, the law, the shipping and manufacturing lines: but in drawing a parallel between England and France, Mr. Babbage is thought to have laid too much stress upon the political honors and distinctions lavished upon men of science in the latter country. "It is," says M. Biot, "a remarkable moral effect of the distinction of ranks so strongly defined and so continually felt in England, that an abstract philosopher like Mr. Babbage, should be brought to confess honorary titles to be satisfactory and grateful to the intellectual class! Doubtless when such distinctions are accorded to merit, the intention should be duly appreciated, but the idea of any precedent or right should not for a moment be entertained." M. Biot makes the following just reflections on the French system of education.

"The immense development of the sciences in France, during the last 40 years, appears to us to have been produced by two causes very different from those pointed out by M. Babbage: two potent causes, of which one exists still, but the other has long ceased to act.

"The *still existing* cause is, the publicity of our higher grades of instruction, and its perfect independence of all pecuniary contributions paid by the auditors. It is thus open to every intelligent mind in a state competent to profit by it. The endowments, liberally assigned by the country, allow the

* We observe in the Philosophical Magazine, that at the grand scientific Reunion at York, committees were established for the promotion of science, and that Major Benson, (W. H. Benson, Esq. C. S. ?) Sir Edward Ryan, Mr. Calder, Mr. J. D. Herbert, (Captain Herbert?) and Mr. J. Prinsep, were appointed a sub-committee for India. No diploma has however yet reached Calcutta, and we trust that the increasing contributions to our Journal are the best guarantee of the non-decline of science in this part of the world!—ED.

professors full liberty to consult only the wants of science, in the tenor and depth of their lectures.

"The lectures delivered at the *College de France*, the *Jardin des Plantes*, and at the *Bibliotheque Royale*, have thus no need of a large audience; and with most of them, if a crowd were attracted, it would be the best proof that their object was not attained. It is far otherwise in England, even in the most recent and liberal institutions. Take as an example the London University: its buildings are superb; its scale of studies is drawn out on the most elevated views; the chairs are occupied by very able men; the auditory is numerous; but the emoluments of the professors depend chiefly on the fees of the scholars, whom it becomes necessary to please by suiting the grade of lectures to the capacity of the majority. This system may be very well for the elementary courses, but it interdicts all attempts at the more refined branches. A professor must be warmed by super-natural zeal, or nobleness of mind, to work at once against his popularity and his interest! and experience in fact shews that even the most distinguished men will rather condescend to lower their powers and become intelligible to the multitude. This general want of elevated courses, accessible to the talented few, and consecrated exclusively to the highest branches of abstract science, forms a void in England, a sort of precipice which arrests the progress of the master spirits by whom otherwise the sciences would be cultivated most successfully.

"The second cause which in our opinion gave a stimulus to sciences among us, was the political and moral state of the public mind at the renovation of order in 1794.

"A mad and atrocious revolution had destroyed our universities, academies, and other establishments of instruction. When the reign of terror subsided, some men devoted to science, and who had continued to cherish her in secret, Monge, Berthollet, Fourcroy, and Guyton, undertook to restore her temples, and they did it with a grandeur of conception which some may think gigantic, but which was admirably fitted to produce a great excitation in men's minds. A normal school was designed, to which pupils should be sent from all parts of France; the professors named were LaGrange and Laplace, who never would have been heard delivering their thoughts in public, had it not been for this revolution; with them were associated Berthollet, Haüy, and Monge himself, whose zeal had kindled general enthusiasm. In these unusual *comitia* of the sciences, philosophical discussions were opened on certain days, and such pupils as Fourrier then started individual doubts to men whose genius had hitherto but spoken in general terms to Europe at large: at the same time Monge, the indefatigable Monge, set up a Polytechnic School, on an extensive and liberal plan, where, animated by his presence and impulse, the youth of France heard with an indescribable enthusiasm, lectures delivered on all parts of the Physical, Mathematical, and Military Sciences, by the first men of those days.

"Moreover these fundamental institutions were followed up by a general system of open public schools through the departments; where professors, occupied solely with such objects, spread around them the knowledge required by the generality of the population. These appointments, paid but poorly, brought nevertheless a feeling of independence and consideration:—they were then honorable; and this sentiment, joined to the complete liberty they enjoyed, fired the professors with the ambition of distinguishing themselves by works of instruction or research in the line of study they had embraced. Hence arose the multitude of first-rate elementary books we now possess, to which is mainly owing the renovation of scientific education among us.

"These, in our opinion, are the true causes which reanimated the sciences in France after the storms of 1793, and which have contrihuted to raise them to the eminence they now enjoy, much more than all the decorations, duchies, ambassadorships, and marquisates ever lavished on their professors."

We must conclude our extracts with the professor's mortifying picture of the reverse now manifest in the state of French education.

"The central schools exist no more: the hand of power has broken them up, as too active instruments of intellectual development. From motives much the same, the system of education at the Polytechnic School has become less elevated and less general. These two blows at progressive improvement, have already enfeebled the study of the higher mathematics, which now only languishes in a few chairs in the *College de France;* so that unless measures be promptly applied, in a short time hence English savans will no longer say that they have abandoned the field of competition in *the calcul* without hope!"

5.—*Letter from Abdúl Mojíd on the subject of the Arbelon Problem.*

[*Literally translated.*]

"I have heard that a certain talented individual was attracted hy my demonstration relative to the Arhelon, and approved the reasoning, but being anxious to render it clearer, he came forward with amendments, and said out his say. I shall therefore acquaint him with a piece of my condition; that from the commencement of my youth, after picking up into my mantle the gleanings of dates and grapes from the gardens of science, I became a lecturer on traditional and intellectual sciences to the wits and the knowing ones of hrilliant genius. I conversed with the generous sages, and repulsed him who was destitute of steadiness, so that it was my custom to move my tongue only when necessary, and to alter my conversation according to the condition of him whom I addressed, agreeably to the alteration of manner. Woe is me, then, that that knowing genius did not direct his view to the qualities of him to whom I had addressed myself, whose exalted name is indicated by this enigmatical symhol. He was satisfied without my multiplying or amplifying words to his lofty dignity and his enlightened sagacity; and this eloquent sage and perspicacious preceptor, through the perfection of his genius, by a mere glance at my abhreviated paper, made himself acquainted with its essence, and requited me ahove what I deserved. Now necessity calls upon me to gallop the horse of my pen into the hippodrome of explanation, as I before interpreted it to his excellency, the centre of the circle of science and politeness, the circumference of the diameters of dignity and gencrosity, the learned, the intelligent editor. I shall therefore first recite the enunciation of this figure, and secondly the first abhreviated explanation, and thirdly its clear and detailed explanation, and if (your correspondent) is satisfied with what I say, shall have attained that which is the object of my hopes, and the end of my lahors. Deo adjectori gloria.

COUPLET.

Be gracious; to the uninformed your pardon free present,
For clemency in nighty men is surely excellent."

Note.—We thank the learned author for the ahove complimentary epistle, and for his revised solution of the prohlem, which in its new shape is sufficiently clear for the most rigid demonstrator; but having puhlished already a second version of the problem, we trust our limited space may be pleaded as an excuse for omitting his present demonstration.—ED.

IX.—*Proceedings of Societies.*

1.—Asiatic Society.

Wednesday, the 2nd May, 1832.

The Hon'ble Sir C. E. Grey, President, in the chair.

1.—Mr. Pearson was proposed as a member by Mr. J. Prinsep, seconded by Mr. Wilson.

2.—The secretary submitted Bills for Rs. 346. 1., the amount of sundry Books purchased for the Society.—*Ordered*, that the amount he discharged.

3.—Read a letter from Dr. Royle, acknowledging the receipt of a letter addressed to the Court of Directors by the President on the part of the Society.

4.—The Secretary reported that difficulties had arisen with regard to the payment of Mr. Bruce's legacy, and recommended that the Treasurers, Messrs Mackintosh and Co. be authorised to apply for and receive the sum, which was accordingly resolved.

5.—Mr. Calder offered to the Society for purchase, a copy of the Baron Cuvier's last edition of the *Regne Animal* and *Histoire des Poissons*, at the invoice cost and charges.—*Resolved*, that the offer be accepted.

6.—Submitted an estimate from Mr. J. Prinsep of the expence of relaying the lower floor of the Society's house.—*Resolved*, that the measure be carried into effect under the supervision of a committee of the Society of the following Gentlemen—Mr. Gordon, Captain Forbes, Captain Jenkins, and Mr. J. Prinsep.

7.—*For the Library.*—Extracts from the Proceedings of the Society of Natural History in the Mauritius, presented through Dr. Casanova.

A copy of India's Cries to British Humanity, presented by the author.

Meteorological Registers for the months of January, February, and March, 1832, presented by the Surveyor General.

Resolved, that the thanks of the Society be presented to the Donors of the above.

8.—*Literary.*—A paper was read by the Secretary, entitled "Notices of the Life of Budd'ha."

[We hope in a subsequent number to present our readers with this interesting paper at length, and shall not therefore here attempt an analysis of its contents.—Ed.]

2.—Medical and Physical Society.

The 5th May, 1832.

Assistant Surgeon J. T. Pearson, Bengal Service, stated his wish to return to the Society, and have his name replaced in the List of Members, in conformity to the resolution passed on the 4th April, 1829, which was complied with accordingly. D. McLeod, Esq. Deputy Inspector General of Hospitals of H. M. Service at Bombay, and John Stokes, Esq. Surgeon in His Highness the Nizam's Service, were proposed as Members by Messrs. Wilson and Twining. S. Ludlow, Esq. Superintending Surgeon, Bengal Service, was proposed by Messrs. Hutchinson and Egerton, and O. Wray, Esq. Surgeon, Bengal Service, proposed by Messrs. Garden and Tytler. Dr. W. C. Blest, President of the Medical Board of Chili, and Dr. Joseph Passaman, of Chili, were proposed as Corresponding Members, by Dr. Casanova and Mr. Twining.

The following communications were then laid before the Society.

1. Remarks on Cholera, by T. E. Baker, Esq.

2. A letter from Mons. Desjardins, Secretary to the Society of Natural History of the Mauritius, inclosing the proceedings of that Society up to 23rd November, 1831.

3. A communication on Vaccination, from Dr. Casanova.

4. A second report on varioloid Diseases, by H. S. Mercer, Esq.

5. A letter from F. P. Strong, Esq. presenting a work, published in 1653, by Dr. Hermannus Vander Heyden, of Ghent; containing an account of Cholera Morbus, and several other diseases then prevalent in Holland.

6. Dr. Hennen's Work on the Medical Topography of the Mediterranean; presented by Dr. Burke, for the Society's Library.

7. Mr. Corbyn's work on Cholera; presented by the author.

8. A short statement drawn up hy a native, relative to an injury of the hip joint, of 10 months duration; and the patient whose case was related, came before the Society for examination.

9. A letter from M. Tierney, Esq. inclosing a copy of a communication from Sir M. Tierney, relative to the efficacy of Cajeputi Oil in Cholera; 50 drops are recommended to he administered in half a wine-glass of tepid water, and repeated every half-hour, until 250 or 300 drops have heen taken. Sir M. Tierney states this remedy to have heen used successfully in the severest cases of Cholera; and that two or three doses, if given early, are usually sufficient to arrest the disease. The statements of the effects of Cajeputi Oil, in Cholera occurring in Calcutta, do not correspond with the good effects, which hy the above account appear to have followed its use in England; that medicine having proved entirely inert when administered under circumstances which authorised expectation of the patient's recovery by the uses of ordinary remedies; as much as six drachms by measure having been given to one patient in the course of five bours without the least effect. By a report puhlished at Madras, it appears that Cajeputi Oil has been recently tried in H. M. 54th Reg. at Trichinopoly, during a severe epidemic visitation of Cholera; the effects of that remedy are stated to be very temporary, and by no means so beneficial as Mr. Hamiltom, the Surgeon of tbe Regiment, had heen led to expect.

The following papers were then read and discussed by the meeting.

Dr. Casanova's replies to the questions proposed by the President at the last meeting of the Society; namely—1st. Whether natural small-pox ever succeeds to a vaccination, in which the specific characters of the vaccine disease have heen developed.—2nd. Whether a person having bad the true vacciue disease, and having heen thereby protected from variola for a certain time, may hecome afterwards liable to contract the natural small-pox.—3rd. Whether the true vaccine disease, by transmission through numerousindividuals, he preserved unchanged, or be capable of undergoing any particular alteration, wherehy its prophylactic properties are diminisbed; or if the virus he deteriorated or capahle of change in different climates.

The author observes, " This is the question which agitates the puhlic mind; shall we be safe from small-pox, if we are vaccinated?" He then offers tbe following replies to tbe queries; 1st, he has sufficient reasons for asserting, that in general the individuals reported to have had variola after vaccination, have in fact either bad spurious cow-pox; or that tbe disease which has supervened after vaccination, instead of being variola, was merely one of the numerous exanthemata which resemble variola in some respects, but are exceedingly different in many of tbe essential characters. He goes on to state, that vaccine lymph taken from a perfect vesicle, and used at the same time in several subjects, is liable to produce genuine vaccine in some, while an imperfect vaccine may be developed in others; and supports this statement by reference to printed reports of numerous experiments made by Dr. Romay and himself at the Havannah, in 1825; which authorise him to say, that spurious vaccine may repeatedly affect the same person, but when the true vaccine has been developed and gone through its regular course, the person is during the rest of bis life insusceptible of either true or false vaccine disease, or of the natural small-pox. He farther refers to experiments made in various countries, which tend to confirm his opinions: the most remarkahle statement which he points out is the summary of observations made hy 43 medical men at Philadelphia in 1828, relative to a variolous epidemic, which raged in that city; where 80,000 vaccinated persons rcsided; and it appeared that only one death from variola took place on tbat occasion, among the above numher of vaccinated persons.

With respect to the 2nd question, Dr. C. does not consider that his opportunities for investigation authorise the expression of a positive opinion; but he has never met with a single case that would support the conjecture of some physicians, that the security afforded hy vaccination against variola is liable to wear out. He proposes that the subject should be submitted to the test of experiments; but as several years would be requisite to settle the question in this way, he observes, that so many medical men must now exist, who having heen vaccinated formerly, and afterwards repeatedly exposed to variolous contagion annually, he thinks an appeal to our professional brethren in tbis country may be at once conclusive. With respect to Mr. Mercer's seven cases reported at the former meeting of the Society, he only acknowledges one to be variola (case 4), and that

there is no evidence of the true vaccine having been previously developed in that case: moreover, as there is no proof that any of the cases had ever been exposed to variolous contagion, in the interval between their alleged vaccination and the appearance of the eruptive disease which formed the subject of report at the last meeting; there is no reason to believe, that those individuals were ever insusceptible of suffering from variolous or varioloid contagion; he contends that we have no reason to believe, if susceptibility to variola be once destroyed by true vaccination, that persons are ever afterwards liable to suffer from variola. Dr. Casanova further says, that before we can acknowledge a renewed susceptibility to variola, in a person who has been once protected, we should ask two questions; 1st, What reason have you for believing that this person has gone through the regular course of true vaccination? 2nd, What reason have you for believing that this person has subsequently to vaccination been exposed to variolous contagion, without contracting small-pox?

In reply to the 3rd question the author states, that either vaccine virus taken from an unhealthy person; or lymph from a perfect pustule used to vaccinate an unhealthy person; may certainly degenerate into an humor *sui generis*, and produce a disease which affords no protection against small-pox. The particular disease stated as likely to influence the character of the vaccine, and to impair its prophylactic properties, are various cutaneous affections, which have been generally acknowledged to be adverse to successful vaccination; and some disordered conditions of the absorbent system, which do not appear to have been before particularly alluded to; but which the author asserts, have an unfavorable influence, in as much as we are protected against variola, only by the vaccine producing a constitutional as well as a local affection, which specific constitutional affection may be frustrated by a disordered condition of the absorbent system. The author also states, that cases have occurred, which render it probable, that the influence of vaccination is altered when several diseases of the mucous membranes occur during its progress, namely, aphthæ, chronic gastro-enteritis, and gonorrhœa. The author having, in concert with Dr. Romay, been engaged in making numerous experiments relative to the vaccine disease, thinks he is authorised to say, that he does not see any reason to acknowledge that vaccine matter is capable of decomposition or change, except from the effects of exposure to air, humidity, or light; and he considers that with due care in its transmission, the specific properties of vaccine remain unaltered.

Mr. Mercer's paper is in continuation of his report read at the former Meeting. He observes that small-pox has been frequent and fatal among both Europeans and Natives; and a large proportion of the mortality has occurred in persons advanced in years, and comparatively few in children. The author alludes to the frequency of rubeola and varicella, as well as of small-pox, this season, and gives a sketch of the distinctive characters of the two latter diseases, according to the best authors, which must be familiar to the profession. Three cases are there detailed, which may be numbered in continuation from those stated in the last month's circular.

Case VIII. A woman of European parents, 26 years of age, had fever on the 28th March; vomiting took place, and the face was flushed. On the 30th an eruption of numerous small pimples appeared; on the 5th April the face was swollen, and the pustules very numerous, and filled with a thick opaque fluid; many of them coalesced: there was slight soreness of the throat, but no salivation, and no fever after the eruption appeared. On the 10th day of the eruption and 12th of the disease, the pustules were drying quickly on the face and some parts of the arms; and on the 19th day of the eruption a second set of crusts fell off. This person had been vaccinated by Mr. Shoolbred when an infant; one vaccine cicatrix is visible, of the size of a garden pea, imperfectly marked with central depressions.

Case IX. An Indo-Briton, 26 years of age, had fever on the 4th April, which increased till the 7th, unattended with vomiting, except when medicine was taken. On the 7th April an eruption of numerous small papulæ appeared, some of which on the 8th contained an opaque fluid, and on the 10th some of them on the hands coalesced; on the 12th desiccation commenced, and on the 14th the scabs began to fall off. This person had been vaccinated at the age of 4 or 5 months by Dr. Hare; there is a small superficial cicatrix on the left arm slightly pitted.

CASE X. An European man, 26 years of age, became feverish on the 8th April; the pyrexia increased, and on the 11th, an eruption of small red pimples appeared and the fever subsided. On the 12th there were about 160 small pustules over the body, those on the face containing a yellow fluid. On the 17th April, some of the pustules had dried, and on the 18th most of the scabs had fallen off from the face, but some of the eruptions on the feet then contained a bluish-colored fluid, and were surrounded by a light red circle about ¼ of an inch broad. This person was vaccinated in England when an infant, and has on his left arm an oblong cicatrix ¾ an inch in length, the surface of which is pitted. All the cases mentioned in Mr. Mercer's former report recovered.

The author is inclined to think from the cases he has met with, that the opinions of some medical men may be in some degree confirmed, viz. "that no greater security is afforded against a 2nd attack of variolous disease by inoculation of small-pox, than by vaccination; and that after a certain lapse of time, the cow-pox loses its power as a preventive of small-pox;" yet, he says, in the greater number of instances of variola supervening on vaccination, the disease is much modified and of a mild character. The author mentions the experiments of Dr. Wolde, reported in the 109th No. of the Edinburgh Medical and Surgical Journal for 1831. Dr. W. had re-vaccinated 100 persons of various ages in Hanover, of whom 20 are represented to have had a perfect vaccine vesicle. Mr. Mercer's report concludes with a very copious extract from the same Journal, relative to the identity of Variola, and the Vaccine disease. The author of that article, Dr. Sonderland, of Barmen, states that the Vaccine disease may be produced in the cow, by covering the animal with a blanket that has been on the bed of a patient who has suffered severely from small-pox, placing another blanket similarly exposed to the variolous contagion, in the stall, so that the animal shall breathe the exhalation from the infected blanket. In a few days the animal is stated to be seized with fever, and on the 4th or 5th day the udders and other parts covered with a hard skin, are said to be affected with an eruption that assumes the appearance of cow-pox, and becomes filled with lymph, which on being used to inoculate the human subject, will produce the vaccine or protective pock. It is but justice to this very interesting subject to state, that Mr. Mercer has made the experiment of covering two cows with cotton clothes that had been on the persons of small-pox patients, but the animals have neither had fever, variola, nor the vaccine disease. In this country it is of vast importance to have the experiment repeated, to verify the fact, that we may always be able to produce the Vaccine disease when it is most required.

A letter from Mr. Mercer, subsequent to this report, mentions two additional cases of varioloid disease, viz. a man aged 27, and a woman aged 24, both born of European parents. The man is stated to have a well-defined vaccine cicatrix on each arm: the woman also bears an imperfect vaccine cicatrix on each arm, both these patients having been vaccinated in infancy. They have a numerous eruption, which in some places is confluent; but they are going through the disease favorably.

Dr. Baikie's observations on the climate of the Neelgherry Hills; and its effects on the sound, and on the impaired European constitution, are prefaced by an account of the weather at Ootacamund. The extreme annual range of the thermometer in the shade is stated to be between 42° and 73° Fahrenheit, but the diurnal range is rarely so much as 11° or 12°. The annual fall of rain does not exceed 42½ inches, and the Barometer's annual range is not great. The elevation of Ootacamund is stated to be 7,197 feet above the level of the sea, and the highest summit of the Neelgherry range is 8,429, being not very different from that of the convent of the Great St. Bernard, in the Alps, and the city of Quito, on the Andes. The S. W. monsoon sets in about the end of May, and lasts till the end of August. The N. E. monsoon begins late in October, and is usually attended with high wind and rain. The greatest heat is experienced in April and May, when however the mean monthly temperature is from 60 to 63. The atmosphere generally, is stated to be remarkably dry, elastic, and exhilarating; highly favorable to European constitutions; consequently the station is deemed an excellent residence for invalids, from the plains of the Deckan, or from the damp hot climate of Bengal. When invalids can choose the time they will proceed to the Neelgher-

ries, April is considered the best month to arrive there; as the transition of temperature from that of the plains is then less than at other seasons of the year. On first arrival at that temperate district, some persons experience slight embarrassment of respiration, and occasional dyspeptic symptoms; which are in some measure ascribed to the elevation of the station; but principally to a slight degree of congestion of internal organs; especially the lungs and liver; arising from the abrupt change of temperature. The climate is stated to be especially favourable to children, who quickly acquire all that alertness, activity, and rosy complexion, so remarkable in the most healthy parts of Europe.

The author next proceeds to specify in detail the effects of the climate on convalescents, and those who were labouring under the chronic stages of several of the more important diseases of India; numbers of whom have been sent to that station. In convalescents from dysentery, and those who had long suffered from the most obstinate chronic dysenteric affections; the best effects were experienced from a residence at Ootacamund: convalescents deriving early and decided benefit from the change; and many inveterate chronic affections which could not be cured at other stations, were soon restored to health by the aid of medicines. The treatment to which Dr. Baikie, from experience, gives a decided preference, is the combination of Ipecacuanha and Extract of Gentian, sometimes united with Blue Pill, and aided by application of leeches when any acute local symptoms required their use: and *a very careful attention to regulated diet, in small quantity.* By these means, the more distressing symptoms were often mitigated after the second dose of medicine; and a week's perseverance in the same remedies, generally sufficed to overcome the most obstinate attacks. Dr. B. has nearly abandoned the exclusive use of Calomel, since this plan of treatment was brought to his notice; he states, that the treatment now followed is more efficacious, more speedy, and more certain than any other; the patients being less liable to relapses than when the mercurial plan of treatment was trusted to. The author mentions, particularly, an inveterate case of chronic dysentery, in which repeated relapses had occurred; and almost every article in the materia medica used in such complaints had been employed in vain; at last, Ipecacuanha and Extract of Gentian were tried, and quickly checked the disease. The patient, who had been long in a most wretched condition, was soon restored to the state of a healthy and robust man. In this case even the Blue Pill proved injurious.

Convalescents from fever derive benefit on arrival at that station almost equal to that experienced by those who have suffered from dysentery. Those persons who were attacked with fever and sufficiently near to be removed to Ootacamund during the progress of the disease, or at its commencement, derived the utmost benefit from the change of climate.

Pulmonary affections, when not so far advanced as to preclude reasonable hope from change to any good climate, find great benefit from residence at this station. And in fact, all cases where debility and exhaustion are the principal affections to be removed: and an uniform elastic, cool, dry, and bracing atmosphere the principal desideratum, the climate of the Neelgherries may be recommended with the utmost confidence.

The diseases which derived comparatively less benefit from the climate of the Neelgherries, are Intermittent Fevers and Hepatic diseases; in which a favorable change is neither so certainly, nor so generally, to be expected; unless the patients be in a very advanced stage of convalescence, and in fact, suffering chiefly from debility; in such cases, and especially after a short sea voyage, these patients recover rapidly: but if they arrive at the hills with much remains of active disease, they become the subjects of tedious medical treatment: the causes of which are clearly shewn to be the internal congestion inseparable from abrupt transition to an elevated and cool climate.

Mercurial Rheumatism, after the treatment of various acute diseases by Calomel, appears to have been a frequent ailment among the convalescents sent to the station at Ootacamund. Dr. Baikie's favorite prescription is Infusion of Sarsaparilla in lime-water, as recommended by Mr. Brodie, according to the following formula.

Sarsaparilla Root, bruised, ℥iiss. Sassafras Root; Guaiacum Wood, rasped, each ℥ii. Liquorice Root ℥i. Recent lime-water, 18 ounces, macerated for 24 hours,

near the fire, and then strained. The whole of this infusion to be drank in the course of the day, at three doses.

The Report concludes with a Table, shewing the ailments of 155 convalescents and sick, who had been under treatment at the Neelgherries; viz. Hepatic diseases 49—Dysentery 28—Fever 23—Mercurial Rheumatism 10—Cephalalgia 5—Various other maladies 40. These had been under treatment between the 1st March, and 1st December, and only six cases are reported "*not better;*" these were 1 Dropsy—2 Hepatitis—1 Rheumatism—1 Intermittent Fever, and 1 Cephalalgia. Of the 155 cases, some of whom were in a most lamentable state from protracted Chronic disease, 80 were cured, and 13 died. Among the deaths were six of Hepatic disease.

3.—AGRICULTURAL AND HORTICULTURAL SOCIETY.

Meeting of the 3rd May, 1832, at the Townhall.

Sir Edward Ryan in the Chair.

Mr. John Willis Alexander was admitted a member of the Society.

The following letters and papers were read:

From Mr. Swinton, Chief Secretary to Government, forwarding another and larger sample of the foreign or ship-borne cotton, found by Major Burney at Yandaboo in Ava.

From Mr. Willis, reporting on this sample. The thanks of the Society were voted to Mr. Swinton, and the Secretary was requested to forward to him a copy of Mr. Willis' report.

The Secretary was also requested to have the cotton carefully separated from the seed, and retained as a specimen, while the seed itself should be forwarded to Mr. De Verine to be sown at Akra.

From Mr. Truscott, Officiating Commercial Resident, Culpee, requesting to be supplied with foreign cotton seed for the purpose of introducing its cultivation largely into Bundlecund.

From Dr. Carey, on the native method of manufacturing paper in India, as requested by the last meeting of the Society.

Resolved, that so soon as Baboo Ram Comul Sen furnishes his paper on the same subject, both essays be sent to Government, for the purpose of being transmitted to Bombay.

From Captain Richmond, Secretary to the Garden Committee, on the cultivation of the *Asparagus officinalis* at Alipore.

The thanks of the meeting were offered to Captain Richmond.

From Mr. Calder, presenting to the Society an extensive collection of samples of Mauritius sugar, collected by him while lately at that place, with accurate notes of the estates where the sugar was produced, degree of refining, mode of effecting it; and the market price of each, extending to 35 samples, in glass and tin.

The thanks of the meeting were offered to Mr. Calder for his valuable donation.

From Mr. Henly, presenting four samples of sugar manufactured by him at Barripore.

The thanks of the meeting were offered to Mr. Henly.

The President, in the name of Colonel Bazetta, presented a packet of fresh Manilla Tobacco seed, the first which had been received by the Society.

The thanks of the meeting were voted to Colonel Bazetta, for this valuable present, and the packet was directed to be forwarded to Akra Farm, for the purpose of immediate experiment, and also of retaining a portion in well secured bottles, till a more favorable season for sowing it.

Mr. Ballard submitted on the part of Mr. D. W. H. Speed, a paper by that gentleman on the culture of silkworms, manufacture of silk, and expense incurred therein, with the view of pointing out the inferiority and dearness of the article at present, arising from the grower of the mulberry, rearer of the cocoons, and reeling of the silk, being wholly distinct and independant individuals. And presenting to the Society, four skeins or hanks of silk produced in his experimental factory, where the whole process, from the growing of the mulberry to the reeling of the silk, was performed by himself.

The thanks of the meeting were voted to Mr. Speed.

Messrs Willis and Earl presented selected samples of all cottons in the Liverpool market in December, 1831, with the prices of each correctly labelled thereon, for reference by the Society.

The thanks of the meeting were offered to Messrs. Willis and Earl for this very valuable present.

Mr. De Verine, superintendant of the Society's Experimental Farm, at Akra, submitted various papers relative thereto; including a tabular statement of the cotton cultivation there from its commencement to the present period, on which to ground assurances of the best season for sowing, of the most suitable seed, soil, and mode of cultivation, with an account of the expense of raising three biggahs of Maranta Arundinacea, (or West India Arrow-root,) and manufacturing the same into farina; and also some observations on the storms of 31st October, and 26th March last.

Mr. De Verine also submitted several specimens of tobacco, cotton, and arrow-root, all reared at the Farm. Mr. Piddington submitted the form of a circular, which he thought if translated into the native languages would remove prejudices, and encourage the ryots to undertake the cultivation of seeds distributed by the Society.

Resolved, that Mr. Piddington be authorized to get his circular translated, and printed on common paper, for distribution.

The Secretary informed the meeting, that he had received only four parcels of silk, with corresponding sealed letters, as competing for the prizes of the Society; and that he had received no samples of sugar and cotton, nor any letters announcing their being on the way.

Resolved, that as the reception of samples of silk, cotton, and sugar was limited to 1st May last, no more samples of silk be now received; and that the competition for the cotton and sugar prizes lie postponed to the season of 1833, it being understood that the prizes for silk and tobacco will be adjudged on the 1st June next, as originally intended.

On the Burmese cotton, received by Mr. Swinton from Major Burney, Mr. Willis reports that he considers it of the same description as that received under Major Burney's previous dispatch, and considered by the Burmese as of foreign origin, with this difference that one-half of the seed when divested of the cotton is quite bald, having a smooth black, or rather brownish coloured skin, while the other half is furred all over with a green fur, very tenaciously adhering. This diversity and peculiarity in the seed, Mr. Willis considers worthy of remark, as it is not to be found in any of the North American kinds, nor in those of Pernambuco, Bourbon, the Seychelles, Tenasserim, or lower Bengal. The cotton is however separated from the seed, both from the bald and furred parts of it, with great and almost equal facility. The fibre is long, fine, and good in strength, and exceedingly suitable for the machine spinner.

Founding his estimate of its English value by the current prices of such sort of cotton in Liverpool in the month of December, 1831, Mr. Willis states this cotton would be worth in England from seven to eight *d.* per lb., at which rate a wide field would appear open to remunerate the cultivator, the merchant, and the ship's owner, if this description of cotton be found capable of having a successful cultivation in this country.

Meteorological Register kept at the Surveyor General's Office, Calcutta, for the Month of May, 1832.

Days of the Month.	Minimum Temperature observed at sunrise. Barometer reduced to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Maximum Pressure observed at 9h. 50m. Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Max. Temp. and Dryness observed at 2h. 40m. Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Minimum Pressure observed at 4h. 0m. Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Observations made at sunset. Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Observations at 10½ P. M. in Calcutta. Barom. red. to 32°.	Temper. of the air.	Depres. of M.B.Ther.	Wind.	Aspect of the sky.	Rain Gauge, No. 1.	Rain Gauge, No. 2.
1	29,688	78,7	1,2	cm.	ci.	,744	87,	6,5	s. e.	cu.	,646	93,	12,1	s.	cu.	,616	89,3	9,8	s.	cu.	,621	85,3	8,3	e.	cl.	,710	78,7	5,9	s.	cl.		
2	,696	78,3	1,8	s.	cl.	,739	86,3	7,1	s.	do.	,689	91,7	12,2	do.	do.	,676	90,	10,8	do.	do.	,703	85,7	8,2	s.	do.	,732	81,5	3,5	s.	str.		
3	,742	79,	2,3	s.	do.	,799	88,7	9,	s.	cl.	,717	90,7	14,5	do.	cl.	,694	89,5	12,	do.	cl.	,711	84,5	6,6	do.	do.	,749	81,8	3,6	s.	cl.		
4	,702	79,3	2,4	s.	do.	,735	89,	9,5	s.	cu.	,603	91,	12,5	do.	cu.	,570	88,3	9,6	do.	cis.	,565	79,5	9,8	do.	cu.	,697	76,8	4,2	s.	cl.		
5	,621	78,	2,1	s. e.	do.	,662	88,3	8,8	s.	do.	,568	90,	9,8	do.	do.	,571	87,3	8,	do.	cu.	,557	86,5	7,	do.	do.	,668	83,7	5,7	s.	cl.		
6	,641	81,	3,3	s. e.	cu.	,678	88,7	7,8	s.	do.	,578	90,7	11,	s. e.	do.	,560	89,	8,5	s. e.	do.	,599	85,5	6,3	s. e.	cus.	,697	83,3	4,5	s.	cus.		
7	,668	81,3	3,4	s. e.	do.	,687	86,7	8,	s.	do.	,618	90,3	9,8	s.	do.	,587	89,	8,1	s.	do.	,626	86,5	7,8	do.	cu.	,692	81,8	3,0	s.	cl.		
8	,676	80,3	2,3	s.	do.	,723	89,3	9,6	s. w.	cl.	,664	92,7	12,7	do.	do.	,640	91,5	11,	do.	do.	,656	85,6	8,7	s.	ci.	,739	82,	3,8	s.	cl.		
9	,712	79,	1,8	s.	do.	,789	88,5	8,5	s.	cu.	,710	95,	14,8	do	do.	,698	94,	13,5	do.	cl.	,708	86,5	8,3	do.	do.	,756	81,7	3,7	s.	cl.		
10	,742	78,5	1,3	cm.	cl.	,781	89,5	7,6	s.	do.	,688	95,5	15,5	do.	do.	,631	93,7	12,2	s. e.	cu.	,697	87,5	7,8	s. e.	cu.	,738	83,2	5,0	s.	cl.		
11	,679	80,3	2,3	cm.	cu.	,719	90,5	11,3	s.	do.	,569	94,5	16,	s. e.	do.	,551	91,5	12,	s. w.	cis.	,561	86,7	8,2	do.	cis.	,637	79,5	4,8	e.	rn.		
12	,626	71,	2,3	w.	rn.	,643	74,	4,3	w.	cus.	,566	88,	12,8	w.	cl.	,541	87,	12,1	w.	cl.	,512	83,3	7,8	cm.	cl.	,613	78,8	3,2	s.	cl.	1,35	1,04
13	,637	80,3	1,6	s.	cu.	,675	87,	6,3	s.	cu.	,605	93,5	10,3	s.	cu.	,594	92,	9,5	s.	cu.	,605	87,5	5,8	s. e.	cis.	,667	83,2	3,3	s.	str.		
14	,656	79,5	1,3	s.	do.	,737	88,5	6,3	s. e.	do.	,658	96,	12,	do.	do.	,654	91,3	9,8	do.	do.	,675	87,5	7,	s.	cu.	,775	84,	3,8	s.	n.		
15	,740	80,5	1,8	cm.	cl.	,807	88,5	7,3	n. e.	do.	,670	98,3	15,4	e.	do.	,644	96,	14,5	e.	do.	,674	89,	7,3	do.	cis.	,756	78,8	5,6	s.	rn.	0,80	0,62
16	,764	72,5	1,8	s. e.	ci.	,802	86,3	10,2	s.	ci.	,706	97,5	18,5	n. w.	cl.	,680	96,	16,8	s.	cl.	,673	88,7	10,5	do.	cl.	,722	81,9	3,7	cm.	cl.		
17	,730	79,5	2,	cm.	cu.	,747	92,3	15,8	s. w.	cl.	,665	99,3	20,6	s.	do.	,635	98,	18,8	do.	do.	,662	89,3	11,6	do.	cis.	,703	83,8	2,8	s.	cl.		
18	,688	79,3	2,1	cm.	do.	,739	90,	8,8	s. w.	do.	,665	97,	14,8	do.	do.	,647	96,5	15,5	do.	do.	,675	88,5	7,3	do.	do.	,751	83,6	3,1	s.	cl.		
19	,725	80,7	3,	cm.	ci.	,770	89,3	7,8	s.	cu.	,687	95,3	12,	do.	cu.	,667	95,	12,1	do.	do.	,674	88,3	6,8	do.	do.	,734	78,2	6,4	n. w.	rn.		
20	,723	81,5	1,8	s. w.	cu.	,767	93,5	8,8	s. w.	do:	,682	86,7	7,5	do.	n.	,669	85,3	8,8	do.	cis.	,692	81,5	4,3	do.	cl.	,706	80,7	3,9	s.	cl.	1,10	10,5
21	,694	79,5	1,3	cm.	cl.	,731	91,7	9,	s. w.	cl.	,641	01,5	21,8	do.	cl.	,524	100,3	27,1	do.	cl.	,629	91,	15,8	do.	do.	,675	84,	2,5	s.	cl.		
22	,655	80,5	2,6	s. e.	do.	,707	91,5	8,3	s. w.	cu.	,602	98,3	15,6	do.	do.	,585	97,7	16,2	do.	do.	,588	89,5	7,	do.	do.	,646	84,3	3,1	cm.	cl.		
23	,634	81,5	2,8	s.	do.	,675	93,	10,3	s. w.	cl.	,605	97,	14,	s. w.	do.	,595	96,	11,3	s. w.	do.	,623	87,5	5,3	do.	cl.	,706	84,	4,0	w.	cus.		
24	,642	82,5	2,8	s.	cu.	,685	91,3	9,6	s. w.	cu.	,605	95,3	12,6	n. e.	do.	,587	93,	12,3	n. e.	cis.	,629	83,	7,8	n. e.	cis.	,684	81,	6,3	e.	cu.		
25	,647	77,5	2,6	s.	cl.	,712	91,5	8,6	s. e.	do.	,622	99,	16,5	s. e.	cis.	,628	78,3	2,6	s.	rn.	,644	80,	6,8	s. w.	do.	,706	78,8	4,5	s.	cl.		
26	,682	78,	1,8	s. e.	do.	,721	92,	8,8	s. e.	cl.	,648	103,	22,3	do.	cu.	,629	101,7	22,5	s. e.	cu.	,667	87,	9,8	s. e.	cu.	,740	84,5	3,1	s.	cl.	0,20	0,15
27	,678	79,5	1,8	s. e.	do.	,725	90,	10,3	s. e.	do.	,630	105,	22,8	s.	cl.	,584	102,1	22,3	cm.	cl.	,594	95,	14,3	cm.	cl.	,674	85,	2,7	s.	cl.		
28	,635	81,5	2,	s.	do.	,685	95,	14,6	s.	do.	,585	106,8	32,8	w.	do.	,569	106,	22,8	w.	do.	,559	94,5	17,8	do.	do.	,631	86,2	3,0	s.	cl.		
29	,576	81,	2,	s. w.	do.	,625	95,	15,	s. w.	do.	,526	109,3	32,6	n.	do.	,503	108,8	32,6	n. w.	do.	,481	94,	15,3	do.	do.	,589	86,8	3,6	s.	cl		
30	,546	82,	1,8	s.	do.	,582	97,3	16,6	s.	do.	,510	110,7	34,8	w.	cu.	,477	109,5	34,	do.	cu.	,464	96,	14,1	n. w.	cu.	,583	86,5	3,1	s.	cl.		
31	,548	82,	2,8	s. w.	do.	,593	97,3	17,8	s. w.	do.	,483	110,5	34,	do.	cl.	,466	110,3	33,8	w.	cl.	,442	94,	10,3	s. w.	cl.	,599	85,4	3,2	s.	ci.		
Mean,	29,664	79,5	2,1			,716	89,9	9,6			,626	96,9	16,9			,604	94,6	15,2			,620	87,6	9,			,692	82,3	3,9			3,45	2,88

Abbreviations. In the column "wind," small letters have been used instead of capitals; *cm.* means *calm.* In the column "aspect of the sky," *cy.* is *cloudy; cl. clear rn. rain, ci. cirrus; cu. cumulus; cs. cirro-stratus; cus. cumulo-stratus; cc. cirro-cumulus; n. nimbus.*